Technical Support Document (TSD)

for the Transport Rule

Docket ID No. EPA-HQ-OAR-2009-0491

Emissions Inventories

U.S. Environmental Protection Agency

Office of Air and Radiation

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Acronyms

AEO	Annual Energy Outlook
BEIS	Biogenic Emission Inventory System
C3	Category 3 (commercial marine vessels)
CAIR	Clean Air Interstate Rule
CAMD	EPA's Clean Air Markets Division
CAM_X	Comprehensive Air Quality Model with Extensions
CAP	Criteria Air Pollutant
CARB	California Air Resources Board
CEM	Continuous Emissions Monitoring
CMAQ	Community Multiscale Air Quality
CMV	Commercial Marine Vessel
DOE	Department of Energy
ECA	Emissions Control Area
EGU	Electric Generating Unit
EISA	Energy Independence and Security Act of 2007
EMFAC	CARB's Emission Factors mobile model
FAA	Federal Aviation Administration
FIPS	Federal Information Processing Standard
HAP	Hazardous Air Pollutant
HWI	Hazardous Waste Incinerator
IMO	International Marine Organization
IPM	Integrated Planning Model
ITN	Itinerant (aircraft operations)
MACT	Maximum Achievable Control Technology
MOBILE6	Mobile Source Emission Factor Model, version 6
MOVES	Motor Vehicle Emissions Simulator
MSAT2	Final Mobile Source Air Toxics Rule
MWC	Municipal Waste Combustor
NAAQS	National Ambient Air Quality Standards
NEEDS	National Electric Energy Database System
NEI	National Emission Inventory
NLEV	National Low Emission Vehicle
NMIM	National Mobile Inventory Model
NSR	New Source Review
OAQPS	EPA's Office of Air Quality Planning and Standards
OECA	EPA's Office of Enforcement and Compliance
ORL	One Record per Line (a SMOKE input format)
OTC	Ozone Transport Commission
MP	Multipollutant
PFC	Portable Fuel Container
RIA	Regulatory Impact Analysis
RFS2	Revised annual Renewable Fuel Standard
RWC	Residential Wood Combustion
SMOKE	Sparse Matrix Operator Kernel Emissions

SCC	Source Category Code
SPPD	Sector Policies and Programs Division
TAF	Terminal Area Forecast
TPY	Tons per Year
TR	Federal Transport Rule
TSD	Technical Support Document
VOC	Volatile Organic Compound
WRAP	Western Regional Air Partnership

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1 Introduction

This document provides the details of emissions data processing done in support of the Environmental Protection Agency's (EPA) rulemaking effort for the Federal Transport Rule proposal (hereafter referred to as TR). The TR air quality modeling results were evaluated with respect to the 1997 annual and 2006 24-hour National Ambient Air Quality Standards (NAAQS) for particulate matter less than 2.5 microns ($PM_{2.5}$), as well as the 1997 8-hour ozone NAAQS. The emissions and modeling effort for TR consists of four 'complete' emissions cases: 2005 base case, 2012 base case, 2014 base case, and 2014 Control case. Table 1-1 provides more information on these emissions cases. The 2012 base case modeling was used to identify future nonattainment and maintenance locations. Not listed in Table 1-1 are source apportionment runs that were based on the 2012 base case to quantify the contributions of emissions in upwind states to annual average 24-hour $PM_{2.5}$ and 8-hour ozone concentrations in other states. The modeling outputs for the 2014 base and control cases were then used to quantify the benefits of this proposal.

Table 1-1. List of cases run in support of the TR air quality modeling

Case Name	Internal EPA Abbreviation	Description
2005 base case	2005ck	2005 case created using average-year fires data and an average-year temporal allocation approach for Electrical Generating Units (EGUs), to use for computing relative response factors with 2012 and 2014 scenarios
2012 base case	2012ck	2012 "baseline" scenario, representing the best estimate for the future year without implementation of EGU remedy controls.
2014 base case	2014ck2	2014 "baseline" scenario, representing the best estimate for the future year without implementation of EGU remedy controls.
2014 Control case	2014ck2_catr1	2014 EGU "control" scenario for attaining 1997 ozone and annual PM standards, and 2006 daily PM standard.

The data used in the 2005 emissions cases are the same as those described in the 2005-based, v4 platform document (http://www.epa.gov/ttn/chief/emch/index.html#2005). The 2005 and future-year emissions scenarios were processed in a form that is required by the Comprehensive Air Quality Model with extensions (CAM_X) version 5 (Environ, 2009). CAM_X is used to estimate base year, future base case and post-control concentrations of ozone and PM, along with deposition of nitrogen and sulfur, which are combined with monitoring data to estimate population-level exposures to changes in ambient concentrations for use in estimating health and welfare effects.

In TR, we used a 2005 base case approach for the year 2005 emissions scenario. The base case approach uses an average-year fire emissions inventory and average-year EGU temporal profiles, which were based on 3 years of hourly Continuous Emissions Monitoring (CEM) data for EGUs. We use a base case approach because we want to reduce year-specific variability in fires and EGUs between 2005 and the future years. For example, each year has different days and different locations with large fires, unplanned EGU shutdowns, and periods of high electricity demand. By using a base-case approach, the temporal and spatial aspects of the inventory for these sources are maintained into the future year modeling, which avoids potentially spurious year-specific artifacts in air quality modeling estimates. In addition, the v4 platform (see reference above) biogenic emissions data was held constant between the 2005 case for TR and all future-year cases run for TR. For TR, the only significant data changes between the 2005 and future-year cases are emission inventories (from all categories but average fires and biogenics) and speciation approaches.

The future-year inventories, ancillary files, and detailed projection data used for this modeling are available as part of the rulemaking Docket EPA-HQ-OAR-2009-0491. Since the data are large, the data files themselves are not posted with online access through the docket, and so a more convenient access location is the EPA Emissions Modeling Clearinghouse website for its 2005 platform (http://www.epa.gov/ttn/chief/emch/index.html#2005). The TR data files are provided as a subheading under this main link.

In the remainder of this document, we provide a description of the approaches taken for the emissions in support of air quality modeling for TR. In Section 2, we briefly review the 2005 base case inventory, including ancillary data and issues related to CAM_X support. In Section 3 we describe the development of the future year 2012 and 2014 base cases. We describe the 2012 Source Tagging scenarios in Section 4. In Section 5, we describe the 2014 EGU control (remedy) case as compared to the 2014 base case. In Section 6 we provide data summaries comparing all four modeling cases and request for comments on specific issues. Section 7 provides a brief discussion on anticipated emissions changes over time for various source sectors and how those changes might impact the maintenance of the proposed standard.

The US EPA seeks comment on growth and control approaches for all modeling sectors, particularly the identification of nonEGU controls or control programs that exist but have not been included in the emissions projections. We also seek comment on all significant source category emissions; for example, we are aware that our upstream oil and gas inventory can be further improved, but do not have data available to do so. The US EPA requests that all such comments be of a quantitative nature with supporting documentation on the source of the information provided. Comments with specific information or new data will supercede more vague comments such as “the emissions seem too low or too high.” Refer to Section 7 for an additional list of specific emissions issues of interest to EPA for comment.

2 Development of Base Case 2005 Emission Inventories

As mentioned previously, the 2005 emissions modeling approach for TR used the same data and approaches as the 2005 v4 base case platform. In this section, we briefly discuss the modeling sectors in the 2005 base case and future year cases as well as the TR-specific issues related to processing emissions for CAM_X.

2.1 Base case 2005 overview

Table 2-1 lists the platform sectors used for the 2005 base case and all future year cases. It also indicates the platform sectors that include HAP emissions and the associated sectors from the National Emission Inventory (NEI). Subsequent sections refer to these platform sectors for identifying the emissions differences between the 2005 base case (v4 platform) and the TR future-year cases. The inputs to the air quality model; including emissions, meteorology, initial conditions, boundary conditions; along with the methods used to produce the inputs and the configuration of the air quality model are collectively known as a ‘modeling platform’.

Table 2-1. Sectors Used in the TR Emissions Modeling Platform

Platform Sector	2005 NEI Sector	Description and resolution of the data input to SMOKE
IPM sector: *ptipm*	Point	2005v2 NEI point source EGUs mapped to the Integrated Planning Model (IPM) model using the National Electric Energy Database System (NEEDS, 2006 version 3.02) database. Hourly files for continuous emission monitoring (CEM) sources are included only for the 2005 evaluation case. Day-specific emissions for non-CEM sources created for input into SMOKE.
Non-IPM sector: *ptnonipm*	Point	All 2005v2 NEI point source records not matched to the ptipm sector, annual resolution. Includes all aircraft emissions.
Average-fire sector: *avefire*	N/A	Average-year wildfire and prescribed fire emissions derived from the 2002 Platform avefire sector, county and annual resolution. Used for the 2005 base year and the future base model runs, but not for the model evaluation case.
Agricultural sector: *ag*	Nonpoint	NH_3 emissions from NEI nonpoint livestock and fertilizer application, county and annual resolution.
Area fugitive dust sector: *afdust*	Nonpoint	PM_{10} and $PM_{2.5}$ from fugitive dust sources from the NEI nonpoint inventory (e.g., building construction, road construction, paved roads, unpaved roads, agricultural dust), county/annual resolution.
Remaining nonpoint sector: *nonpt*	Nonpoint	Primarily 2002 NEI nonpoint sources not otherwise included in other SMOKE sectors, county and annual resolution. Also includes updated Residential Wood Combustion emissions and year 2005 non-California Western Regional Air Partnership (WRAP) oil and gas "Phase II" inventory.
Nonroad sector: *nonroad*	Mobile: Nonroad	Monthly nonroad emissions from the National Mobile Inventory Model (NMIM) using NONROAD2005 version nr05c-BondBase for all states except California. Monthly emissions for California created from annual emissions submitted by the California Air Resources Board (CARB) for the 2005v2 NEI.
locomotive, and non-C3 commercial marine: *alm_no_c3*	Mobile: Nonroad	Year 2002 non-rail maintenance locomotives, and category 1 and category 2 commercial marine vessel (CMV) emissions sources, county and annual resolution. Unlike prior platforms, aircraft emissions are now included in the ptnonipm sector and category 3 CMV emissions are now contained in the seca_c3 sector
C3 commercial marine: *seca_c3*	Mobile : Nonroad	Annual point source formatted year 2005 category 3 (C3) CMV emissions, developed for the EPA rule called "Control of Emissions from New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder", usually described as the Emissions Control Area (ECA) study, originally called SO_2 ("S") ECA.
Onroad California, NMIM-based, and MOVES sources not subject to temperature adjustments: *on_noadj*	Mobile: onroad	Three, monthly, county-level components: 1) Onroad emissions from NMIM using MOBILE6.2, other than for California. 2) California onroad, created using annual emissions submitted by CARB for the 2005v2 NEI. Onroad gasoline non-motorcycle vehicle emissions from draft MOVES not subject to temperature adjustments: exhaust CO, NO_X, VOC, some VOC HAPs, and evaporative VOC and some VOC Hazardous Air Pollutants (HAPs).
Onroad cold-start gasoline exhaust mode vehicle from MOVES subject	Mobile: onroad	Monthly, county-level draft MOVES-based onroad non-motorcycle gasoline emissions subject to temperature adjustments. Limited to exhaust mode only for PM species and Naphthalene. California emissions not included. This sector is limited to cold start mode

Platform Sector	2005 NEI Sector	Description and resolution of the data input to SMOKE
to temperature adjustments: ***on_moves_startpm***		emissions that contain different temperature adjustment curves from running exhaust (see on_moves_runpm sector).
Onroad running gasoline exhaust mode vehicle from MOVES subject to temperature adjustments: ***on_moves_runpm***	Mobile: onroad	Monthly, county-level draft MOVES-based onroad non-motorcycle gasoline emissions subject to temperature adjustments. Limited to exhaust mode only for PM species and Naphthalene. California emissions not included. This sector is limited to running mode emissions that contain different temperature adjustment curves from cold start exhaust (see on_moves_startpm sector).
Biogenic: ***biog***	N/A	Hour-specific, grid cell-specific emissions generated from the BEIS3.14 model -includes emissions in Canada and Mexico.
Other point sources not from the NEI: ***othpt***	N/A	Point sources from Canada's 2006 inventory and Mexico's Phase III 1999 inventory, annual resolution. Also includes annual U.S. offshore oil 2005v2 NEI point source emissions.
Other point sources not from the NEI, Hg only: ***othpt_hg***	N/A	Annual year 2000 Canada speciated mercury point source emissions.
Other nonpoint and nonroad not from the NEI: ***othar***	N/A	Annual year 2006 Canada (province resolution) and year 1999 Mexico Phase III (municipio resolution) nonpoint and nonroad mobile inventories, annual resolution.
Other nonpoint sources not from the NEI, Hg only: ***othar_hg***	N/A	Annual year 2000 Canada speciated mercury from nonpoint sources.
Other onroad sources not from the NEI: ***othon***	N/A	Year 2006 Canada (province resolution) and year 1999 Mexico Phase III (municipio resolution) onroad mobile inventories, annual resolution.

As discussed in the 2005 v4 platform documentation, we processed all emissions data with a custom version of the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system, version 2.5. Users seeking to replicate modeling done for this effort can use version 2.6 of SMOKE. More details about SMOKE including user documentation are available at its website (http://www.smoke-model.org).

For the 2005 base case, all inventory and ancillary input data files used as inputs for this rule can be found at the 2005-based platform website (http://www.epa.gov/ttn/chief/emch/index.html#2005).

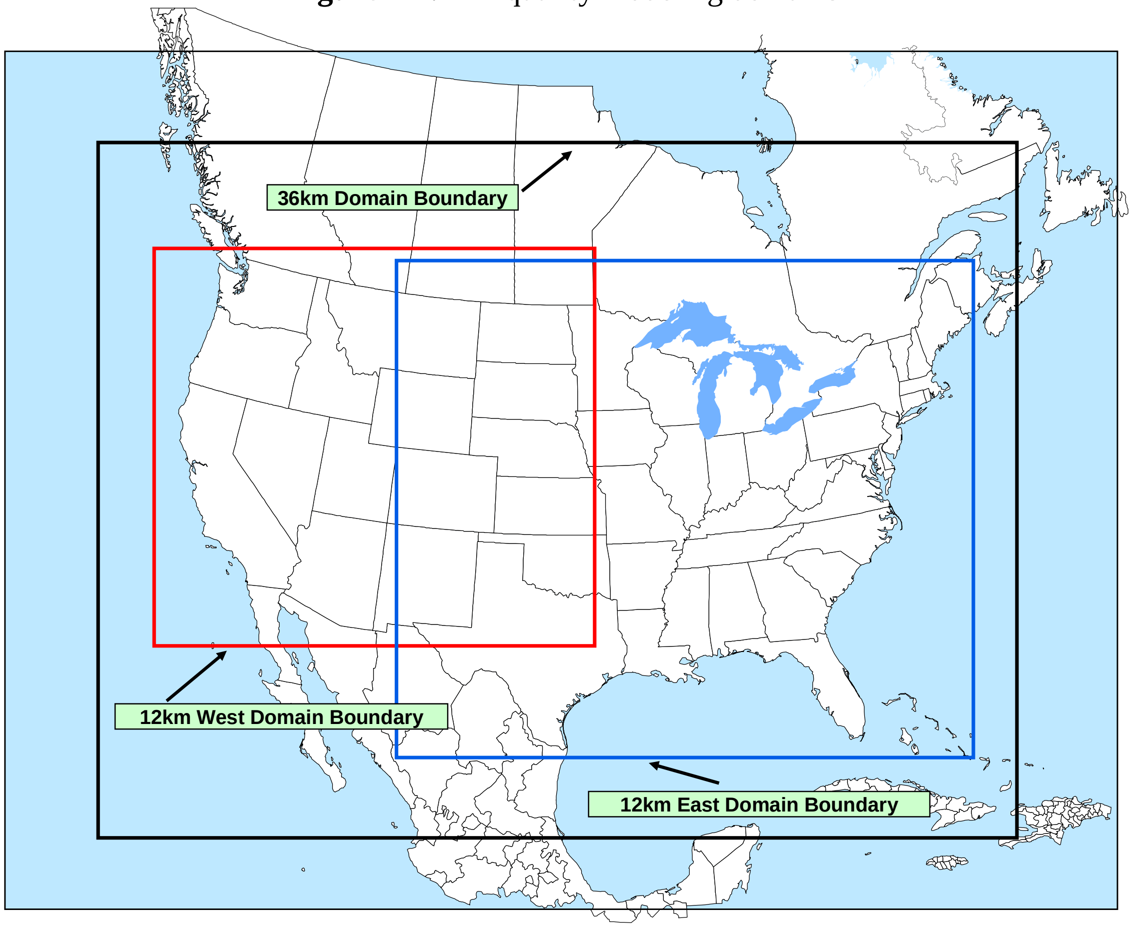
2.2 Custom processing configuration for Transport Rule Emissions Modeling

In support of the TR proposal, EPA modeled the air quality in the East using a horizontal grid resolution of 12 x 12 km. This Eastern 12 km modeling domain covers 37 states from Texas to North Dakota and all states to the east of those, and was "nested" within a modeling domain covering the remainder of the lower 48 states using a grid resolution of 36 x 36 km[1]. Therefore, unless noted to the contrary, the tables of emissions in this document cover the contiguous 48 states. A map of the air quality modeling domains is in

[1] The air quality predictions from the 36 km Continental US (CONUS) domain were used to provide incoming "initial" and "boundary" concentrations for the Eastern 12 km domain.

Figure 2-1. The domains relevant to TR are the 12km East domain within the blue boundary, and the national 36km domain. The 12km West domain is not used for TR.

Figure 2-1. Air quality modeling domains



All three grids use a Lambert-Conformal projection, with Alpha = 33º, Beta = 45º and Gamma = -97º, with a center of X = -97º and Y = 40º. Other specific parameters for these grids are provided in the TR Air Quality Modeling Technical Support Document.

Emissions are first processed for the Community Multiscale Air Quality (CMAQ) model, and then post-processed via conversion scripts into a form appropriate for use by CAM_X These conversion scripts are a series of programs run using shell scripts and simple programs to convert the merged 2-dimensional CMAQ emissions into CAM_X format. These scripts also convert the elevated inline CMAQ emissions files for each sector into CAM_X format and merge each converted sector file into one daily elevated emissions file.

3 Development of 2012 and 2014 Future Year Base Case Emission Inventories

This section describes the methods we used for developing the 2012 and 2014 future year base case emissions. The year 2012 source apportionment scenarios and the 2014 EGU control case are discussed in Sections 4 and 5, respectively. The ancillary input data are very similar in the future year scenarios as those in the 2005 base case except for the speciation profiles used for gasoline-related sources, which change in the future to account for increased ethanol usage in gasoline. Appendix A provides a table of differences between these ancillary input data between the 2005 base case and these future year scenarios. The specific speciation profile changes are discussed in Sections 3.2.8 and 3.3.5.

The future base case projection methodologies vary by sector. The 2012 and 2014 base cases represent predicted emissions in the absence of any further controls beyond those Federal measures already promulgated. For EGU emissions (ptipm sector), all rules and settlements that were finalized by February 3, 2009 have been included. For mobile sources (on_noadj, on_moves_runpm, and on_moves_startpm sectors), all national measures for which data were available at the time of modeling have been included. The future base case scenarios do reflect projected economic changes and fuel usage for EGU and mobile sectors. For nonEGU point (ptnonipm sector) and nonpoint stationary sources (nonpt, ag, and afdust sectors), local control programs that might have been necessary for areas to attain the 1997 $PM_{2.5}$ NAAQS annual standard, 2006 PM NAAQS (24-hour) standard, and the 1997 ozone NAAQS are not included in the future base case projections. This is because the nonattainment areas for the 1997 $PM_{2.5}$ and ozone standards were not announced until 2004 and 2005 respectively, and the corresponding state implementation plans (SIPs) were not due until 2007 and 2008, thereby preventing the inclusion of these local measures in the 2005 emissions inventory. Whether any of these SIPs controls are included in the final rule depends on a couple of factors: 1) the SIPs must be approved and made available, and 2) the control measures and technologies are provided in such a way that they can be applied to our inventories (e.g., control efficiencies or emission reductions matched to specific NEI facilities, units, and/or source category codes (SCCs). The following bullets summarize the projection methods used for sources in the various sectors, while additional details and data sources are given in Table 3-1:

- IPM sector (ptipm): Unit-specific estimates from IPM, version 3.02.
- Non-IPM sector (ptnonipm): Projection factors and percent reductions reflect emission reductions due to control programs, plant closures, consent decrees and settlements. Also used projection approaches for point source livestock and aircraft and gasoline stage II emissions that are consistent with projections used for the sectors that contain the bulk of these emissions. Terminal area forecast (TAF) data aggregated to the national level were used for aircraft to account for projected changes in landing/takeoff activity. Year-specific speciation was applied to some portions of this sector and is discussed in Section 3.2.8.
- Average fires sector (avefire): No growth or control.
- Agricultural sector (ag): Projection factors for livestock estimates based on expected changes in animal population from 2005 Department of Agriculture data; no growth or control for NH_3 emissions from fertilizer application.
- Area fugitive dust sector (afdust): Projection factors for dust categories related to livestock estimates based on expected changes in animal population; no growth or control for other categories in this sector.
- Remaining Nonpoint sector (nonpt): Projection factors that reflect emission reductions due to control programs. Residential wood combustion projections based on growth in lower-emitting stoves and a reduction in higher emitting stoves. PFC projection factors reflecting impact of the final Mobile Source Air Toxics (MSAT2) rule. Gasoline stage II projection factors based on National Mobile Inventory Model (NMIM)-estimated VOC refueling estimates for future years. Year-specific speciation was applied to some portions of this sector and is discussed in Section 3.2.8.
- Nonroad mobile sector (nonroad): Output from the NONROAD2005 model, which was run using NMIM, includes final controls from the final loco-marine and small spark ignition OTAQ rules. California-specific data provided by the state of California. Year-specific speciation was applied to some portions of this sector and is discussed in Section 3.3.5.

- Aircraft, locomotive, and non-Class 3 commercial marine sector (alm_no_c3): Projection factors for Class 1 and Class 2 commercial marine and locomotives which reflect activity growth and final locomotive-marine controls.
- Class 3 commercial marine vessel sector (seca_c3): base year 2002 emissions grown to future years without Emissions Control Area (ECA) or International Marine Organization (IMO) global NO_X and SO_2 controls.
- Onroad no-adjustment for temperature mobile sector (on_noadj): Non-refueling NMIM-based except for gasoline vehicle NO_X, CO, VOC, and select VOC HAPs which are from draft MOVES, and gasoline vehicle PM and naphthalene which are in the on_moves_startpm and on_moves_runpm sectors. California-specific data provided by the state of California. VOC speciation uses same combination of profiles as are used for exhaust and evaporative nonroad mobile profiles.
- Onroad PM gasoline running mode sector (on_moves_startpm): Running mode draft MOVES future year state-month estimates for PM and naphthalene, apportioned to the county level using NMIM state-county ratios matched to vehicle and road types.
- Onroad PM gasoline start mode sector (on_moves_startpm): Cold start draft MOVES future year state-month estimates for PM and naphthalene, apportioned to the county level using NMIM state-county ratios of local urban and rural roads by vehicle type.
- Other nonroad/nonpoint (othar): No growth or control.
- Other nonpoint speciated mercury (othar_hg): No growth or control.
- Other onroad sector (othon): No growth or control.
- Other nonroad/nonpoint (othar): No growth or control.
- Other point (othpt): No growth or control.
- Other point speciated mercury (othpt_hg): No growth or control.
- Biogenic: 2005 emissions used for all future-year scenarios.

Table 3-1 summarizes the control strategies and growth assumptions by source type used to create the 2012 and 2014 base case emissions from the 2005 base case inventories. Note that mercury (Hg) is listed in the pollutants column; however, we did not include Hg in our future year modeling. All Mexico, Canada, and offshore oil emissions are unchanged in all future case scenarios from those in the 2005 base case. Emission summaries by sector for 2005 and future years are provided in Section 6. Note that a few controls are not fully promulgated by 2012 but are by 2014. For example the Maximum Achievable Control Technology (MACT) rule "Boat Manufacturing" has a compliance date in year 2013; therefore the VOC control associated with this MACT rule is not reflected in the 2012 base Case but is reflected in the 2014 base and control cases.

The detailed projection factors used for these future year emissions have hundreds of thousands of records and are not therefore listed in this document or in a spreadsheet. Rather, the detailed projection data can be obtained from docket for this rule and from the Emissions Modeling Clearinghouse website listed in Section 1.

The remainder of this section is organized either by source sector or by specific emissions category within a source sector for which a distinct set of data were used or developed for the purpose of projections. This organization allows consolidation of the discussion of the emissions categories that are contained in multiple sectors, because the data and approaches used across the sectors are consistent, and do not need to be repeated. Sector names associated with the emissions categories are provided in parentheses. A list of inventory datasets used for this and all cases is provided in Appendix B.

Table 3-1. Control strategies and growth assumptions for creating 2012 and 2014 base case emissions inventories from the 2005 base case

Control Strategies and/or growth assumptions (Grouped by Affected Pollutants or Standard and Approach Used to Apply to the Inventory)	Pollutants Affected	Approach or Reference:
Non-EGU Point (ptnonipm) Controls		
Consent decrees apportioned to several plants	VOC, CO, NOx, PM, SO_2 some VOC HAPs	
DOJ Settlements: plant SCC controls Alcoa, TX Premcor (formerly MOTIVA), DE	NOx, SO_2	1
Refinery Consent Decrees: plant/SCC controls *(a few of these controls are promulgated in year 2013, and thus are not reflected in the 2012 base case)*	NOx, PM, SO_2	2
Closures, pre-2008: plant control of 100% Auto plants Pulp and Paper Large Municipal Waste Combustors Small Municipal Waste Combustors Plants closed after the 2005v2 point inventory was released (pre-2008 closures)	All	3
Industrial Boiler/Process Heater plant/SCC controls for PM	PM	4
Large Municipal Waste Combustors (LMWC)	PM, Hg, and metals	5
Small Municipal Waste Combustors (SMWC)	PM, Hg, metals, NOx, SO_2	5
MACT rules, national, VOC: national applied by SCC, MACT Boat Manufacturing *(promulgated in year 2013, thus not reflected in the 2012 base case)* Wood Building Products Surface Coating Generic MACT II: Spandex Production, Ethylene manufacture Large Appliances Miscellaneous Organic NESHAP (MON): Alkyd Resins, Chelating Agents, Explosives, Phthalate Plasticizers, Polyester Resins, Polymerized Vinylidene Chloride Reinforced Plastics Asphalt Processing & Roofing Iron & Steel Foundries Metal: Can, Coil Metal Furniture Miscellaneous Metal Parts & Products Municipal Solid Waste Landfills Paper and Other Web Plastic Parts Plywood and Composite Wood Products Carbon Black Production Cyanide Chemical Manufacturing Friction Products Manufacturing Leather Finishing Operations Miscellaneous Coating Manufacturing Organic Liquids Distribution (Non-Gasoline) Refractory Products Manufacturing Sites Remediation	VOC	EPA, 2007a
Solid Waste Rules (Section 129d/111d) Hospital/Medical/Infectious Waste Incinerator Regulations	NOx, PM, SO_2	EPA, 2005

Control Strategies and/or growth assumptions (Grouped by Affected Pollutants or Standard and Approach Used to Apply to the Inventory)	Pollutants Affected	Approach or Reference:
MACT rules, plant-level, VOC: Auto Plants	VOC	6
MACT rules, plant-level, PM & SO_2: Lime Manufacturing	PM, SO_2	7
MACT rules, plant-level, PM: Taconite Ore	PM	8
Stationary Area Assumptions		
Municipal Waste Landfills: project factor of 0.25 applied	VOC	EPA, 2007a
Livestock Emissions Growth from year 2002 to years 2012 and year 2015	NH_3	9
Residential Wood Combustion Growth and Changeouts from year 2005 to years 2012 and 2015	all	10
Gasoline Stage II growth and control from year 2005 to years 2012 and 2015	VOC	11
Portable Fuel Container MSAT2 inventory growth and control from year 2005 to years 2012 and 2015	VOC	12
EGU Point Controls		
Updated Title IV SO2 allowance bank assumption and Energy Independence and Security Act of 2007 (EISA) using IPM 3.0.2 EISA 3e	NO_X, SO_2, PM	13
Onroad Mobile and Nonroad Mobile Controls (list includes all key mobile control strategies but is not exhaustive)		
National Onroad Rules: Tier 2 Rule 2007 Onroad Heavy-Duty Rule Final Mobile Source Air Toxics Rule (MSAT2) Renewable Fuel Standard	all	
Local Onroad Programs: National Low Emission Vehicle Program (NLEV) Ozone Transport Commission (OTC) LEV Program	VOC	14
National Nonroad Controls: Clean Air Nonroad Diesel Final Rule – Tier 4 Control of Emissions from Nonroad Large-Spark Ignition Engines and Recreational Engines (Marine and Land Based): "Pentathalon Rule" Clean Bus USA Program Control of Emissions of Air Pollution from Locomotives and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder	all	15, 16, 17
Aircraft, Locomotives, and Commercial Marine Assumptions		
Aircraft: Itinerant (ITN) operations at airports to year 2020	all	18
Locomotives: Energy Information Administration (EIA) fuel consumption projections for freight rail Clean Air Nonroad Diesel Final Rule – Tier 4 Locomotive Emissions Final Rulemaking, December 17, 1997 Control of Emissions of Air Pollution from Locomotives and Marine	all	EPA, 2009; 19; 16
Commercial Marine: EIA fuel consumption projections for diesel-fueled vessels OTAQ ECA C3 Base 2020 inventory for residual-fueled vessels Clean Air Nonroad Diesel Final Rule – Tier 4 Emissions Standards for Commercial Marine Diesel Engines, December 29, 1999 Tier 1 Marine Diesel Engines, February 28, 2003	all	19; EPA, 2009

APPROACHES:

1. For ALCOA consent decree, used http:// cfpub.epa.gov/compliance/cases/index.cfm; for MOTIVA: used information sent by State of Delaware
2. Used data provided by EPA, OAQPS, Sector Policies and Programs Division (SPPD) –see Section 3.2.6.

3. Closures obtained from EPA SPPD sector leads; most verified using the World Wide Web –see Section 3.2.6.
4. Used data list of plants provided by project lead from 2001-based platform; required mapping the 2001 plants to 2002 NEI plants due to plant id changes across inventory years. See Section 3.2.6.
5. Used data provided by EPA, OAQPS SPPD expert –see Section 3.2.6.
6. Percent reductions recommended and plants to apply to reduction to were based on recommendations by rule lead engineer, and are consistent with the reference: EPA, 2007a
7. Percent reductions recommended are determined from the existing plant estimated baselines and estimated reductions as shown in the Federal Register Notice for the rule. SO_2 % reduction will therefore be 6147/30,783 = 20% and PM10 and PM2.5 reductions will both be 3786/13588 = 28%
8. Same approach as used in the 2006 Clean Air Interstate Rule (CAIR) -estimates reductions of "PM emissions by 10,538 tpy, a reduction of about 62%." Used same list of plants as were identified based on tonnage and SCC from CAIR: http://www.envinfo.com/caain/June04updates/tiop_fr2.pdf
9. Except for dairy cows and turkeys (no growth), based on animal population growth estimates from USDA and Food and Agriculture Policy and Research Institute. See Section 3.2.1.
10. Expected benefits of woodstoves change-out program: http://www.epa.gov/woodstoves/index.html
11. VOC emission ratios of year 2020-specific from year 2005 from the National Mobile Inventory Model (NMIM) results for onroad refueling including activity growth from VMT, Stage II control programs at gasoline stations, and phase in of newer vehicles with onboard Stage II vehicle controls.
12. VOC and benzene emissions for year 2020 from year 2002 from MSAT2 rule (EPA, 2007b)
13. http://www.epa.gov/airmarkt/progsregs/epa-ipm/index.html
14. Only for states submitting these inputs: http://www.epa.gov/otaq/lev-nlev.htm
15. http://www.epa.gov/nonroad-diesel/2004fr.htm
16. http://www.epa.gov/cleanschoolbus/
17. http://www.epa.gov/otaq/marinesi.htm
18. Federal Aviation Administration (FAA) Terminal Area Forecast (TAF) System, December 2007: http://www.apo.data.faa.gov/main/taf.asp
19. http://www.epa.gov/nonroad-diesel/2004fr.htm

3.1 Stationary Source Projections: IPM sector (ptipm)

The future year data for the ptipm sector were created by the IPM model version3.02 EISA. The EPA Clean Air Markets Division (CAMD) manages the development of this model and maintains a website that documents the latest IPM version used in the TR proposal “Updates to EPA Base Case v3.02 EISA Using the Integrated Planning Model”:
http://www.epa.gov/airmarkets/progsregs/epa-ipm/index.html.

The IPM is a multiregional, dynamic, deterministic linear programming model of the U.S. electric power sector. IPM Version 3.02 EISA features an updated Title IV SO_2 allowance bank assumption, reflects state rules and consent decrees through February 3, 2009, and incorporates updates related to the Energy Independence and Security Act of 2007. Units with advanced controls (e.g., scrubber, SCR) that were not required to run for compliance with Title IV, New Source Review (NSR), state settlements, or state-specific rules were allowed in IPM to decide on the basis of economic efficiency whether to operate those controls.

We used IPM results for 2012 directly and used IPM results to represent 2014.

OAQPS post-processed these data in the same way as described in the 2005 v4 platform documentation for the “base case” to create daily emissions that include temporal allocation information from three years of Continuous Emissions Monitoring (CEM) data. The temporal allocation approach is the same as for the 2005 base case to eliminate artificial differences in temporal allocation between the base and future years.

3.2 Stationary Source Projections: non-IPM sectors (ptnonipm, nonpt, ag, afdust)

To project U.S. stationary sources other than ptipm, we applied growth factors and/or controls to certain categories within the ptnonipm, nonpt, ag and afdust platform sectors. This subsection provides details on the data and projection methods used for these sectors. In estimating future-year emissions, we assumed that emissions growth does not track with economic growth for many stationary non-IPM sources. This "no-growth" assumption is based on an examination of historical emissions and economic data. While we are working toward improving the projection approach in future emissions platforms, we are still using the no-growth assumption for the 2005, v4 platform. More details on the rationale for this approach can be found in Appendix D of the Regulatory Impact Assessment for the PM NAAQS rule (EPA, 2006).

Year-specific projection factors for year 2012 were used for creating the 2012 base case; however, year 2015 projection factors were used to create the 2014 base case unless noted otherwise. A 2015 base case was initially developed and it was decided rather late in the TR modeling process to instead use a year 2014 base case. Most projections are not year-specific, and most of the year-specific projections do not differ significantly between year 2014 and year 2015. We intend to use 2014-specific emissions for all sectors in the final Transport Rule modeling.

Growth factors (and control factors) are provided in the following sections where feasible. However, some sectors used growth or control factors that varied geographically and their contents could not be provided in the following sections (e.g., gasoline distribution varies by county and pollutant and has thousands of records). If the growth or control factors for a sector are not provided in a table in this document, they are available as a "projection" or "control" packet for input to SMOKE on:
ftp://ftp.epa.gov/EmisInventory/2005v4/projection_control_packets

3.2.1 Livestock emissions growth (ag, afdust, ptnonipm)

Growth in ammonia (NH_3) and dust (PM_{10} and $PM_{2.5}$) emissions from livestock in the ag, afdust and ptnonipm sectors was based on projections of growth in animal population. Table 3-2 provides the growth factors from the base case 2005 emissions to future years 2012 and 2014 for animal categories. For example, year 2015 (2014) beef emissions are 1.8% larger than the 2005 base case emissions. Except for dairy cows and turkey production, the animal projection factors are derived from national-level animal population projections from the U.S. Department of Agriculture (USDA) and the Food and Agriculture Policy and Research Institute (FAPRI). For dairy cows and turkeys we assumed that there would be no growth in emissions. This assumption was based on an analysis of historical trends in the number of such animals compared to production rates. Although productions rates have increased, the number of animals has declined. Thus, we do not believe that production forecasts provide representative estimates of the future number of cows and turkeys; therefore, we did not use these forecasts for estimating future-year emissions from these animals. In particular, the dairy cow population is projected to decrease in the future as it has for the past few decades; however, milk production will be increasing over the same period. Note that the ammonia emissions from dairies are not directly related to animal population but also nitrogen excretion. With the cow numbers going down and the production going up we suspect the excretion value will be changing, but we assumed no change because we did not have a quantitative estimate.

The inventory for livestock emissions used 2002 emissions values therefore, our projection method projected from 2002 rather than from 2005. For the 2012 base case, year 2009 and year 2014 projection factors were interpolated to create year 2012 projection factors. For the 2014 base case, year 2015 projection factors were used because of the late change from 2015 to 2014, and were developed by interpolating year 2014 and year 2020 projection factors. We intend to update the projections in the final rule using the latest available data from the Department of Agriculture and for 2014 instead of 2015.

Appendix E in the 2002v3 documentation provides the animal population data and regression curves used to derive the growth factors: http://www.epa.gov/scram001/reports/Emissions%20TSD%20Vol2_Appendices_01-15-08.pdf. Appendix F in the same document provides the cross references of livestock sources in the ag, afdust and ptnonipm sectors to the animal categories in Table 3-2.

Table 3-2. Growth factors from year 2005 to future years for Animal Operations

Animal Category	Projection Factors	
	2012	**2015 (used for 2014)**
Dairy Cow	1.000	1.000
Beef	1.014	1.018
Pork	1.060	1.077
Broilers	1.230	1.298
Turkeys	1.000	1.000
Layers	1.160	1.209
Poultry Average	1.178	1.232
Overall Average	1.0623	1.081

3.2.2 Residential wood combustion growth (nonpt)

We projected residential wood combustion emissions based on the expected increase in the number of low-emitting wood stoves and the corresponding decrease in other types of wood stoves. As newer, cleaner woodstoves replace older, higher-polluting wood stoves, there will be an overall reduction of the emissions from these sources. The approach cited here was developed as part of a modeling exercise to estimate the expected benefits of the woodstoves change-out program (http://www.epa.gov/woodstoves/index.html). Details of this approach can be found in Section 2.3.3 of the PM NAAQS Regulatory Impact Analysis (EPA, 2006).

The specific assumptions we made were:

- Fireplaces, SCC=2104008001: increase 1%/yr
- Old woodstoves, SCC=2104008002, 2104008010, or 2104008051: decrease 2%/yr
- New woodstoves, SCC=2104008003, 2104008004, 2104008030, 2104008050, 2104008052 or 2104008053: increase 2%/yr

For the general woodstoves and fireplaces category (SCC 2104008000) we computed a weighted average distribution based on 19.4% fireplaces, 71.6% old woodstoves, 9.1% new woodstoves using 2002v3 Platform (these emissions have not been updated for the 2005v4 platform used for the TR proposal) emissions for $PM_{2.5}$. These fractions are based on the fraction of emissions from these processes in the states that did not have the "general woodstoves and fireplaces" SCC in the 2002 NEI. This approach results in an overall decrease of 1.056% per year for this source category.

Table 3-3 presents the projection factors used to project the 2005 base case (2002 emissions) for residential wood combustion. For the 2012 base case, year 2009 and year 2014 projection factors were interpolated to create year 2012 projection factors. For example, year 2015 (2014) "Fireplaces: General" (SCC=2104008001) emissions are 13% higher than the base case 2005 emissions. For the 2014 base case, year 2015 projection factors were used because of the late change from 2015 to 2014, and were developed by interpolating year 2014 and year 2020 projection factors. We intend to use 2014 projects in the final rule.

Table 3-3. Projection Factors for growing year 2005 Residential Wood Combustion Sources to future years

SCC	SCC Description	Projection Factors	
		2012	**2015 (used for 2014)**
2104008000	Total: Woodstoves and Fireplaces	0.8944	0.8627
2104008001	Fireplaces: General	1.1000	1.1300
2104008070	Outdoor Wood Burning Equipment		
2104008002	Fireplaces: Insert; non-EPA certified	0.8000	0.7400
2104008010	Woodstoves: General		
2104008051	Non-catalytic Woodstoves: Non-EPA certified		
2104008003	Fireplaces: Insert; EPA certified; non-catalytic	1.2000	1.2600
2104008004	Fireplaces: Insert; EPA certified; catalytic		
2104008030	Catalytic Woodstoves: General		
2104008050	Non-catalytic Woodstoves: EPA certified		
2104008052	Non-catalytic Woodstoves: Low Emitting		
2104008053	Non-catalytic Woodstoves: Pellet Fired		

3.2.3 Gasoline Stage II growth and control (nonpt, ptnonipm)

Emissions from Stage II gasoline operations in the 2005 base case are contained in both nonpt and ptnonipm sectors. The only SCC in the nonpt inventory used for gasoline Stage II emissions is 2501060100 (Storage and Transport; Petroleum and Petroleum Product Storage; Gasoline Service Stations; Stage II: Total). The following SIC and SCC codes are associated with gasoline Stage II emissions in the ptnonipm sector:

- SIC 5541 (Automotive Dealers & Service Stations, Gasoline Service Stations, Gasoline service stations)
- SCC 40600401 (Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Filling Vehicle Gas Tanks - Stage II;Vapor Loss w/o Controls)
- SCC 40600402 (Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Filling Vehicle Gas Tanks - Stage II;Liquid Spill Loss w/o Controls)
- SCC 40600403 (Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Filling Vehicle Gas Tanks - Stage II;Vapor Loss w/o Controls)
- SCC 40600499 (Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Filling Vehicle Gas Tanks - Stage II;Not Classified

We used a consistent approach across nonpt and ptnonipm to projection these gasoline stage II emissions. The approach involved computing VOC-specific projection factors from the NMIM results for onroad refueling, using ratios of future–year emissions to 2005 base case emissions. The approach accounts for three elements of refueling growth and control: (1) activity growth (due to VMT growth as input into NMIM), (2) emissions reductions from Stage II control programs at gasoline stations, and (3) emissions reductions resulting from the phase in over time of newer vehicles with onboard Stage II vehicle controls. We assumed that all areas with Stage II controls in 2005 continue to have Stage II controls in all future calendar years.

We computed the VOC projection factors at a county-specific, annual resolution as shown below:

$$PF_{[\text{county, future year}]} = VOC\_RFL_{[\text{county, future year}]}/VOC\_RFL_{[\text{county, 2005}]}$$

where VOC_RFL is the VOC refueling emissions for onroad sources from NMIM.

We applied these projection factors to both nonpt and ptnonipm sector gasoline stage II sources.

Chemical speciation requires certain VOC HAPs for integrated sources, specifically, benzene, acetaldehyde, formaldehyde, and methanol. Therefore, for integrated sources such as this category, the VOC HAPs are also projected based on ratios of future year and base year VOC. However, only benzene (and naphthalene, a VOC HAP that does not impact speciation) refueling emissions were supplied, and so only VOC and benzene emissions were projected. For benzene and naphthalene projection factors, simply replace "VOC" in the above equation.

For the 2012 base case, year 2012 NMIM refueling emissions were used to create county-level by-pollutant ratios to year 2005 NMIM refueling emissions. For the 2014 base case, year 2015 projection factors were used because of the late change from 2015 to 2014, developed from ratios of 2015 to 2005 NMIM refueling emissions.

3.2.4 Portable fuel container growth and control (nonpt)

We obtained future-year VOC emissions from Portable Fuel Containers (PFCs) from inventories developed and modeled for EPA's MSAT rule (EPA, 2007b). Additional information on the PFC inventories can be found in Section 2.2.3, above. The future-year emissions reflect projected increases in fuel consumption, state programs to reduce PFC emissions, standards promulgated in the MSAT rule, and impacts of the Renewable Fuel Standard (RFS) on gasoline volatility. Future-year emissions for PFCs were available for 2010, 2015, 2020, and 2030. In creating the inventories for the TR proposal, we created year 2012 emissions by linearly interpolating year 2010 and year 2015 inventories. The year 2015 PFC inventory was used as-is for the 2014 base case because of the late change from 2015 to 2014. Benzene future-year PFC emissions were also added to the inventory for the 2005 v4 platform and used in VOC speciation for CMAQ through HAP-CAP integration calculations.

3.2.5 Aircraft growth (ptnonipm)

Unlike the 2002v3 platform, aircraft emissions are contained in the ptnonipm inventory. These 2005 point source emissions are projected to future years using the same method, by applying activity growth using data on itinerant (ITN) operations at airports. The ITN operations are defined as aircraft take-offs whereby the aircraft leaves the airport vicinity and lands at another airport, or aircraft landings whereby the aircraft has arrived from outside the airport vicinity. We used projected ITN information available from the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF) System: http://www.apo.data.faa.gov/main/taf.asp (publication date December 2008). This information is available for approximately 3300 individual airports, for all years up to 2025. We aggregated and applied this information at the national level by summing the airport-specific (U.S. airports only) ITN operations to national totals by year and by aircraft operation, for each of the four available operation types: commercial, general, air taxi, military. We computed growth factors for each operation type by dividing future-year ITN by 2005-year ITN. We assigned factors to inventory SCCs based on the operation type.

The methods that the FAA used for developing the ITN data in the TAF are documented in: http://www.faa.gov/data_research/aviation/aerospace_forecasts/2009-2025/media/2009%20Forecast%20Doc.pdf

Table 3-4 provides the national level growth factors for aircraft; all factors are applied to year 2005 emissions. For example, year 2014 commercial aircraft emissions are 8.9% higher than year 2005 emissions. Year 2014 factors are actually year 2015 factors as the future base year was developed before we had a chance to rerun for a year 2014 base year. The differences between year 2014 and year 2015 factors are within 1-3%.

Table 3-4. Factors used to project base case 2005 aircraft emissions to future years

SCC	SCC Description	Year 2012 factor	Year 2014 factor
2275001000	Military aircraft	0.967	0.968
2275020000	Commercial aircraft	1.019	1.089
2275050000	General aviation	0.962	0.986
2275060000	Air taxi	0.872	0.910
27501015	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Military;Jet Engine: JP-5	0.967	0.968
27502001	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Commercial;Piston Engine: Aviation Gas	1.019	1.089
27502011	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Commercial;Jet Engine: Jet A	1.019	1.089
27505001	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Civil;Piston Engine: Aviation Gas	0.962	0.986
27505011	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Civil;Jet Engine: Jet A	0.962	0.986
27601014	Internal Combustion Engines;Rotary Wing Aircraft L & TO Exhaust;Military;Jet Engine: JP-4	0.967	0.968
27601015	Internal Combustion Engines;Rotary Wing Aircraft L & TO Exhaust;Military;Jet Engine: JP-5	0.967	0.968

We did not apply growth factors to any point sources with SCC 27602011 (Internal Combustion Engines; Rotary Wing Aircraft L & TO Exhaust; Commercial; Jet Engine: Jet A) because the plant names associated with these point sources appeared to represent industrial facilities rather than airports. This SCC is only in one county, Santa Barbara, California (State/County FIPS 06083).

None of our aircraft emission projections account for any control programs. We considered the NO_X standard adopted by the International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection (CAEP) in February 2004, which is expected to reduce NO_X by approximately 2% in 2015 and 3% in 2020. However, this rule has not yet been adopted as an EPA (or U.S.) rule; therefore, the effects of this rule were not included in the future-year emissions projections.

3.2.6 Stationary Source control programs, consent decrees & settlements, and plant closures (ptnonipm, nonpt)

We applied emissions reduction factors to the 2005 emissions for particular sources in the ptnonipm and nonpt sectors to reflect the impact of stationary-source control programs –including consent decrees and settlements- and plant closures. Our approach is very similar to what we did for the 2002v3 platform in that we included many of the same plant closures and controls. Here we describe the complete contents of the controls and closures for the 2012 and 2014 base cases.

Controls from the NO_X SIP call were assumed to have been implemented by 2005 and captured in the 2005 base case (2005 NEI v2 point inventory). This assumption was confirmed by review of the 2005 NEI that showed reductions from Large Boiler/Turbines and Large Internal Combustion Engines in the Northeast states covered by the NOx SIP call. The future-year base controls consist of the following:

- We did not include MACT rules where compliance dates were prior to 2005 because we assumed these were already been reflected in the 2005 inventory. The EPA OAQPS Sector Policies and Programs Division (SPPD) provided all controls information related to the MACT rules.

- We included plant closures (i.e., emissions were zeroed out for future years) where information indicated that the plant was actually closed. However, plants projected to close in the future (post-2008) were not removed in the future years because these projections can be inaccurate due to economic improvements. These plant closures affect the following sources: auto plants, pulp and paper plants, large and small municipal waste combustors (LMWC and SMWC), as well as plants closed before 2008 but following the release of the 2005v2 point inventory. The EPA OAQPS SPPD provided the closures information.
- In addition to plant closures, we included the effects of the Department of Justice Settlements and Consent Decrees on ptnonipm sector emissions. We also included estimated impacts of HAP standards per Section 112, 129 of the Clean Air Act on ptnonipm and nonpt sector emissions, based on expected CAP co-benefits to sources in these sectors.
- The same reductions were applied across all years with the exception of the Boat Manufacturing MACT and refinery facility/SCC reductions for the states and pollutants listed in Table 3-5.
- Numerous controls have compliance dates beyond 2008; these include refinery and the Office of Compliance and Enforcement (OECA) consent decrees, Department of Justice (DOJ) settlements, as well as most national VOC MACT controls. Additional OECA consent decrees information is provided in Appendix C, and the details data used are available at the website listed in Section 1.
- The refinery consent decrees are the only controls in which some of the compliance dates are beyond June 2014 and are thus not applied to either the 2012 or 2014 base cases. The EPA OAQPS SPPD provided these controls at the facility and SCC level.
- We applied most of the control programs as replacement controls, which means that any existing percent reductions ("baseline control efficiency") reported in the NEI were removed prior to the addition of the percent reductions due to these control programs. Exceptions to replacement controls are "additional" controls, which were applied for many settlements and consent decrees where specific plant and multiple-plant-level reductions/targets were desired. Applying controls as "additional" controls ensures that the controlled emissions match desired reductions regardless of the baseline control efficiencies in the NEI. Another exception is municipal waste landfills where VOC was reduced 75% via a MACT control using projection factors of 0.25 instead of control efficiencies because no other nonpt sector source category was subject to controls.

Table 3-5. States with post-2012 controls

Control type	**State**	**NO_X**	**SO_2**	**PM**	**VOC**
Post-2012 controls					
Refinery controls	IL	**X**	**X**	**X**	
Refinery controls	OK	**X**			
Refinery controls	PA	**X**	**X**	**X**	
Refinery controls	TX	**X**	**X**		
Boat Manufacturing, national MACT rule	All				**X**

We intended to use a SMOKE "control" packet (data file) to apply all control factors that implement known emissions reductions and plant closures from point sources. However, many of the "additional" controls were inadvertently not applied for the 2012 base case. Specifically, many of the consent decrees apportioned to several plants (see Table 3-1) were not correctly matched with the inventory and hence were not applied. This emissions processing error is confined to the 2012 base case and was fixed when we processed the 2014 base case. The impact of these "missed" reductions is very small for any given state, with the largest impact being a 2.6% overestimate of all SO2 emissions in Louisiana. The percent of the total non-biogenics emissions that were over-estimated are provided in Table 3-6.

Table 3-6. Impact on Total Non-Biogenic Emissions of Not Applying "Additional" Controls on the 2012 Base Case

State	Pollutant	2012 Base Case: Modeled	2012 Base Case: Corrected	Missing Reductions	Percent of Total non-biogenic Inventory Erroneously Not Reduced
Alabama	CO	1,344,754	1,344,560	194	0.0%
Indiana	CO	1,639,008	1,638,902	106	0.0%
Iowa	CO	770,339	761,169	9,170	1.2%
Texas	CO	3,994,619	3,994,353	266	0.0%
US Total*	**CO**	**63,028,528**	**63,018,558**	**9,970**	**0.0%**
Alabama	NO_X	364,171	363,942	229	0.1%
California	NO_X	1,103,014	1,102,114	900	0.1%
Indiana	NO_X	505,127	504,960	167	0.0%
Iowa	NO_X	251,721	251,239	482	0.2%
Pennsylvania	NO_X	566,418	565,213	1,205	0.2%
Texas	NO_X	1,343,319	1,337,590	5,729	0.4%
Washington	NO_X	273,839	273,115	724	0.3%
US Total*	**NO_X**	**15,083,338**	**15,073,725**	**9,613**	**0.1%**
Alabama	PM_{10}	195,954	195,828	126	0.1%
Indiana	PM_{10}	475,925	475,789	136	0.0%
Michigan	PM_{10}	288,392	288,094	298	0.1%
Minnesota	PM_{10}	512,813	511,148	1,665	0.3%
Missouri	PM_{10}	521,063	520,715	348	0.1%
US Total*	**PM_{10}**	**12,572,792**	**12,569,781**	**3,011**	**0.0%**
Indiana	$PM_{2.5}$	121,110	120,976	134	0.1%
Michigan	$PM_{2.5}$	83,415	83,262	153	0.2%
Minnesota	$PM_{2.5}$	111,407	110,725	682	0.6%
Missouri	$PM_{2.5}$	103,327	103,073	254	0.2%
Texas	$PM_{2.5}$	299,720	299,322	398	0.1%
US Total*	**$PM_{2.5}$**	**3,960,713**	**3,958,793**	**1,920**	**0.0%**
Alabama	SO_2	462,297	461,099	1,198	0.3%
California	SO_2	230,482	227,828	2,654	1.2%
Georgia	SO_2	676,193	676,059	134	0.0%
Illinois	SO_2	866,396	866,262	134	0.0%
Indiana	SO_2	986,626	986,458	168	0.0%
Iowa	SO_2	250,954	249,906	1,048	0.4%
Kentucky	SO_2	781,249	779,229	2,020	0.3%
Louisiana	SO_2	341,731	333,221	8,510	2.6%

State	Pollutant	2012 Base Case: Modeled	2012 Base Case: Corrected	Missing Reductions	Percent of Total non-biogenic Inventory Erroneously Not Reduced
Missouri	SO_2	570,761	569,522	1,239	0.2%
Ohio	SO_2	1,076,493	1,076,201	292	0.0%
Pennsylvania	SO_2	1,119,712	1,116,811	2,901	0.3%
Texas	SO_2	640,682	633,445	7,237	1.1%
US Total*	**SO_2**	**13,390,283**	**13,362,585**	**27,698**	**0.2%**
Alabama	VOC	316,558	316,337	221	0.1%
Delaware	VOC	26,227	26,097	130	0.5%
Illinois	VOC	472,361	472,145	216	0.0%
Indiana	VOC	319,116	318,217	899	0.3%
Iowa	VOC	156,642	156,433	209	0.1%
Kansas	VOC	187,046	186,655	391	0.2%
Kentucky	VOC	221,416	221,155	261	0.1%
Michigan	VOC	465,273	462,798	2,475	0.5%
Mississippi	VOC	271,525	271,417	108	0.0%
Missouri	VOC	277,715	276,585	1,130	0.4%
US Total*	**VOC**	**14,604,636**	**14,598,595**	**6,041**	**0.0%**

* The US Totals represent contiguous U.S. including the District of Columbia

3.2.7 Upstream oil and gas projections in non-California WRAP states (nonpt)

The upstream oil and gas nonpt inventory in the non-California WRAP (Western Regional Air Partnership) states is unchanged from the year 2005 Phase II inventory used in the 2005 base case. Year 2018 emissions Phase II WRAP data was available; however, we decided to not interpolate these emissions for the 2012 and 2014 modeling scenarios. Upstream oil and gas emissions in all other states are also unchanged from the 2005 base case.

3.2.8 Future Year VOC Speciation for gasoline-related sources (ptnonipm, nonpt)

To account for the future projected increase in the ethanol content of fuels, different future year VOC speciation was used for certain gasoline-related emission sources. Such sources include gasoline stage II, PFCs, and finished fuel storage and transport-related sources related to bulk terminals (where the ethanol may be mixed) and downstream to the pump. We identified this last group of sources as “btp” (from bulk terminals to pumps). While most of these sources are in the nonpt sector, there were also some in the ptnonipm. The same profiles were used for 2012 and 2014, and were developed based on AEO projections of ethanol fuels for the year 2022. All gasoline stage II and “btp” sources used the same combination of E0 and E10 headspace profiles and an E85 evaporative profile (since no E85 headspace profile was available). The combinations used were: 10.894% E0, 89.031% E10 and 0.075% E85. The PFC emissions used only E10 profiles.

VOC speciation for gasoline stage II and finished fuel storage and transport (from bulk terminals to pumps) utilizes a combination of E0, E10 and E85 gasoline VOC headspace profiles and an E85 evaporative VOC profile, instead of using all E0 gasoline profiles as did the 2005 base case.

3.3 Mobile source projections

Mobile source monthly inventories of onroad and nonroad mobile emissions were created for 2012 and 2014 using a combination of the NMIM and draft MOVES models. Mobile source emissions were further linearly interpolated between 2012 and 2015 to estimate 2014 emissions. Emissions for these years reflect onroad mobile control programs including the Light-Duty Vehicle Tier 2 Rule, the Onroad Heavy-Duty Rule, and the Mobile Source Air Toxics (MSAT2) final rule. Nonroad mobile emissions reductions for these years include reductions to locomotives, various nonroad engines including diesel engines and various marine engine types, fuel sulfur content, and evaporative emissions standards.

Onroad mobile sources are comprised of several components and are discussed in the next subsection (3.3.1). Monthly nonroad mobile emission projections are discussed in subsection 3.3.2. Locomotives and Class 1 and Class 2 commercial marine vessel (C1/C2 CMV) projections are discussed in subsection 3.3.3, and Class 3 (C3) CMV projected emissions are discussed in subsection 3.3.4.

3.3.1 Onroad mobile (on_noadj, on_moves_runpm, on_moves_startpm)

The onroad emissions were primarily based on the National Mobile Inventory Model (NMIM) monthly, county, process level emissions. For both 2012 and 2014, emissions from onroad gasoline sources were augmented with emissions based on the same preliminary version of the Motor Vehicle Emissions Simulator (MOVES) as was used for 2005. The preliminary MOVES data more closely reflects the $PM_{2.5}$ and NO_X emissions in the final release of MOVES 2010 than those from NMIM. MOVES-based emissions were computed for CO, NO_X, VOC, $PM_{2.5}$, PM_{10}, naphthalene, and some VOC HAPs. The same MOVES-based $PM_{2.5}$ temperature adjustment factors were applied as were used in 2005 for running mode emissions; however, cold start emissions used year-specific temperature adjustment factors. The temperature adjustments have the minor limitation that they were based on the use of MOVES national default inputs rather than county-specific inputs, because a county-specific database for input to MOVES was not available at the time this approach was needed. However, the $PM_{2.5}$ temperature adjustments are fairly insensitive to the county-specific inputs, which is why this is characterized as a minor limitation.

<u>NMIM-based onroad emissions (on_noadj)</u>

Future-year NMIM emissions are the key component to creating the future-year 2012 and 2014 onroad mobile emissions. These emissions were used as described here for the 2012 and 2014 cases:

1. Used as-is for all non-California motorcycles and diesel vehicles;
2. Used as-is for all non-California gasoline onroad vehicles except the following pollutants: CO, NO_X, evaporative mode VOC, benzene, and naphthalene, and exhaust mode PM, 1,3-butadiene (106990), acetaldehyde (75070), acrolein (107028), benzene (71432), and formaldehyde (50000), and naphthalene (91203);
3. Used as-is for all California NH_3;
4. Used to resolve road type resolution for California SCCs for Heavy Duty Diesel Vehicles (HDDV) class 6 & 7 (2230073XXX) emissions. California does not specify road types, so we used NMIM California ratios to break out vehicle emissions to the match the more detailed NMIM level.
5. Used to allocate 2005 MOVES-based emissions from the state to the county resolution;

Both year 2012 and 2014 NMIM emissions account for increased vehicle miles traveled (VMT) activity and changes in fuels, fleet turnover, and inspection and maintenance programs that account for implementation of national and local regulations. Future-year VMT data for year 2012 were projected from 2005 to 2012 using year 2006 Annual Energy Outlook (AEO) data. Year 2014 NMIM emissions are interpolated from year 2015 and year 2012 NMIM estimates. Since the 2015 emissions were based on newer, lower VMT projections using 2009-based AEO data, we first adjusted the 2015 emissions using ratios of 2006-AEO VMT to 2009-AEO VMT. This VMT adjustment slightly increased the 2015 emissions to create a consistent VMT approach with 2012 prior to interpolating to create 2014 emissions values. This explanation is captured in the formula for 2014 NMIM-based emissions, which is provided below. The calculations are performed for each month, county, and SCC:

$$NMIM_{2014} = 1/3 \times NMIM_{2012} + 2/3 \times NMIM_{2015} \times \text{AEO2006-based } VMT_{2015} \,/\, \text{AEO2009-based } VMT_{2015}$$

The NMIM future-year inputs also accounted for national and some local control programs. For national control programs, they incorporated the expected impacts of national regulations promulgated prior to July 2007; these include the "Tier 2 Rule," the "2007 Onroad Heavy-Duty Rule," the Final "Mobile Source Air Toxics Rule" (MSAT2 Final), and the "Renewable Fuel Standard" (RFS).

For the state and voluntary programs, we included the National Low Emission Vehicle Program (NLEV) and the Ozone Transport Commission (OTC) LEV program (http://www.epa.gov/otaq/levnlev.htm) in the future year inventories. These were included based on state submission of the relevant NMIM input files. These programs affect northeastern states. We also modeled reformulated gasoline opt-in programs using state-submitted NMIM input files and EPA fuel tables. In addition, we assumed that all state programs existing in 2005 continued in all future calendar years.

We included programs that might affect future VMT (e.g., public transportation, car-pooling, congestion pricing) only if states submitted 2005 base-year VMT that modeled these programs. We do not have documentation from the states describing whether or not such programs were incorporated in the states' VMT estimates.

We did not include state regulations or voluntary programs that encourage no refueling or evening refueling on Ozone Action Days. We also did not include diesel retrofit and anti-idling programs affecting school buses and diesel trucks.

Both year 2012 and 2014 (2015) NMIM onroad inventories use NMIM version 20071009, with county database NCD20070912 (with 2006 meteorology copied from 2005), and MOBILE version M6203CHC\M6203ChcOxFixNMIM.exe.

<u>California onroad</u> (on_noadj)

We did not use NMIM to generate future-year onroad emissions for California, because the 2005 base year emissions were based on CARB's Emission Factors mobile model (EMFAC), which CARB submitted for the 2005 NEI. For California, we chose an approach that would maintain consistency between the base year and future year emissions. This approach involved computing projection factors from a consistent set of future and 2005-year data based on the EMFAC2007 model provided by CARB. We generated projection factors by dividing the EMFAC2007-based emissions for the future years by the EMFAC2007-based emissions for 2005. California does not specify road types, so we used NMIM California ratios to break out vehicle emissions to the match the more detailed NMIM level.

Like year 2005 emissions, future-year California NH_3 emissions are from NMIM runs for California. In addition, the California onroad inventory does not use the MOVES-based emissions. Year 2012 California CAP emissions were linearly interpolated between year 2009 and year 2014 projections. For both 2012 and 2014, future year HAP emissions were computed as 2005v2-based HAP-CAP ratios applied at the pollutant and Level 3 SCC (first 7 characters) to 2012 and 2014 CAP emissions. HAPs were scaled to either of three pollutants: exhaust $PM_{2.5}$ (e.g., metals), exhaust VOC (e.g., exhaust mode VOC HAPs such as acetaldehyde and formaldehyde), or evaporative VOC (e.g., evaporative mode VOC HAPs such as benzene).

<u>MOVES-based no-adjust</u> (on_noadj)

As discussed in the 2005v4 documentation, a draft version[2] of the MOVES model was used to provide year 2005 non-California emissions from onroad gasoline vehicles for several pollutants. We used this draft MOVES model to make sure to include the $PM_{2.5}$ emissions from onroad gasoline vehicles, which include temperature affects and are much larger than previous estimates of onroad $PM_{2.5}$. The onroad gasoline emissions, except for motorcycles, were based on MOVES for the pollutants listed in Table 3-7. Unlike our use of NMIM, we used the MOVES data to create emissions by state and month and then allocated these to counties based on 2005 NMIM county-level data. While EPA will eventually replace this approach with a county-specific implementation of MOVES, it was the best available approach for this modeling. EPA continues to work towards a county resolution MOVES approach by (1) reducing the run time needed for county resolution modeling, and (2) completing efforts to create a national database of county-specific inputs to MOVES.

Table 3-7. Pollutants covered by the draft MOVES model in the 2005 Platform[1]

Used in all TR Year 2005, 2012, and 2014 Cases	**Available from draft MOVES, but not used in TR Cases**
$PM_{2.5}$; exhaust, partially speciated[2]	Naphthalene[3]
VOC; except refueling	1,3 butadiene[4]
CO	Acrolein[4]
NO_X	
Benzene; except refueling	
Formaldehyde	
Acetaldehyde	

[1] Draft MOVES data were used only for onroad gasoline vehicles with the exception of motorcycles. Draft MOVES data were not used for any California onroad emissions
[2] Exhaust mode $PM_{2.5}$ species from MOVES consist of: PEC, PSO4 and the difference between $PM_{2.5}$ and PEC (named as "PM25OC"). Brake wear and tire wear $PM_{2.5}$ emissions were not available from draft MOVES.
[3] Used for the RFS2 version of the platform (EPA, 2010)
[4] Used for the RFS2 and LD GHG versions of the platform

Year 2012 MOVES-based emissions were estimated by scaling year 2005 MOVES emissions by ratios of NMIM emissions from 2012 and 2005. These ratios were computed at the pollutant and SCC-level. This simple scaling was done for all MOVES emissions in 2012 –including pre-temperature adjusted PM emissions (PM species calculated at 72 ºF) discussed in the next section. The very simple formula for computing MOVES 2012 emissions for each month, county, SCC, pollutant, and mode is:

$$MOVES_{2012} = MOVES_{2005} * NMIM_{2012} / NMIM_{2005}$$

Year 2014 MOVES-based emissions were scaled from the 2012 MOVES (scaled from 2005) to year 2014 using OTAQ-provided annual, national, SCC7-level (vehicle type) 2012-2014 ratios by pollutant and mode. These national-level adjustments, based on annual national runs of draft MOVES for years 2012 and 2014, were applied to the detailed 2012 MOVES level of the inventory – by month, county, pollutant, and SCC

[2] As of December 2009, this draft version was replaced by the publicly released :MOVES2010 version at www.epag.gov/otaq/models/moves/

(vehicle and road type). The formula for computing MOVES 2014 emissions for each month, county, SCC, pollutant, and mode is:

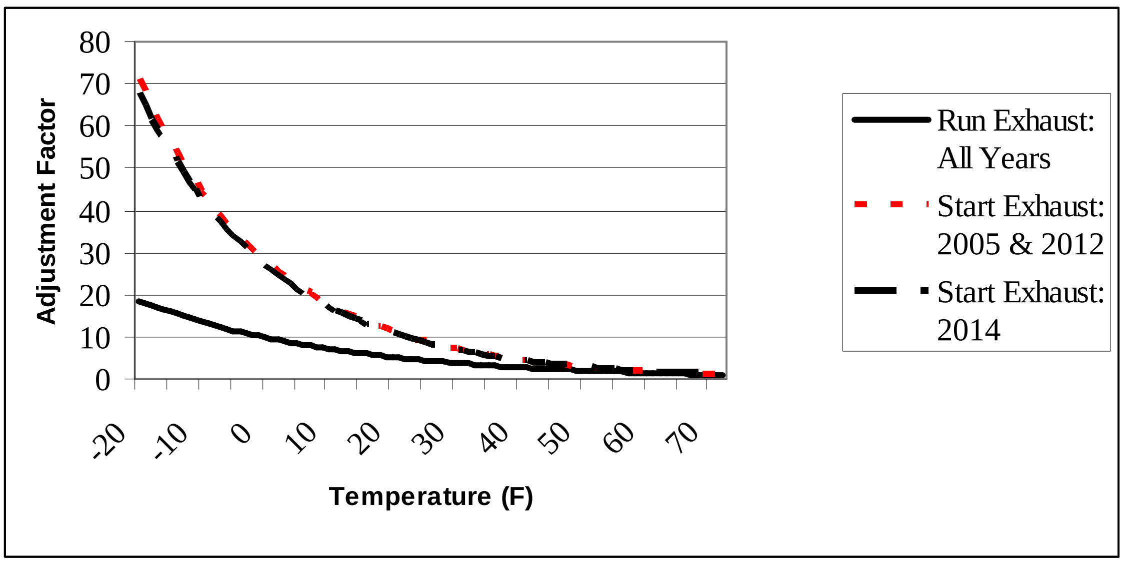
$$MOVES_{2014} = MOVES_{2012} * MOVES\_US\_ANNUAL_{2014} / MOVES\_US\_ANNUAL_{2012}$$

<u>MOVES-based cold start and running mode</u> (on_moves_startpm and on_moves_runpm)

MOVES-based cold start and running mode emissions consist of non-motorcycle gasoline exhaust speciated PM and naphthalene. These pre-temperature-adjusted emissions are projected to year 2012 and 2014 from year 2005 inventories using the same scaling equations discussed in the previous paragraphs for MOVES-based no-adjust emissions.

MOVES-based temperature adjustment factors were applied to gridded, hourly emissions using gridded, hourly meteorology. As seen in Figure 3-1, for year 2012, we used the same temperature adjustment factors as the 2005 base case for both start and running modes. However, cold start temperature adjustment factors decrease slightly in future years, and for year 2014 processing, we updated the temperature adjustment curves for these cold start emissions. These have little impact, reducing cold-start mode temperature-adjusted PM and naphthalene by under 4% for temperatures down to 0 °F. Note that running exhaust temperature adjustment factors are the same for all years. Also, these running mode exhaust mode emissions are considerably larger than cold start mode emissions.

Figure 3-1. MOVES exhaust temperature adjustment functions for 2005, 2012, and 2014



3.3.2 Nonroad mobile (nonroad)

This sector includes monthly exhaust, evaporative and refueling emissions from nonroad engines (not including commercial marine, aircraft, and locomotives) derived from NMIM for all states except California. Like the onroad emissions, NMIM provides nonroad emissions for VOC by three emission modes: exhaust, evaporative and refueling. Unlike the onroad sector, nonroad refueling emissions for nonroad sources are not dropped from processing.

With the exception of California, U.S. emissions for the nonroad sector (defined as the equipment types covered by NMIM) were created using a consistent NMIM-based approach as was used for 2005, but projected for 2012 and 2015. Similar to the onroad mobile NMIM inventories, year 2014 NMIM emissions were created by interpolating year 2012 and year 2015 NMIM inventories. These future-year emissions account for increases in activity (based on NONROAD model default growth estimates of future year equipment population) and changes in fuels and engines that reflect implementation of national regulations and local control programs.

The national regulations incorporated in the modeling are those promulgated prior to December 2009, and beginning about 1990. Recent rules include:

- "Clean Air Nonroad Diesel Final Rule - Tier 4": (http://www.epa.gov/nonroaddiesel/2004fr.htm), published June 29, 2004, and,
- Control of Emissions From Nonroad Large Spark-Ignition Engines, and Recreational Engines (Marine and Land-Based), November 8, 2002 ("Pentathalon Rule").
- OTAQ's Locomotive Marine Rule: (http://www.epa.gov/otaq/regs/nonroad/420f08004.htm)
- OTAQ's Small Engine Spark Ignition ("Bond") Rule: (http://www.epa.gov/otaq/equip-ld.htm)

We have not included voluntary programs such as programs encouraging either no refueling or evening refueling on Ozone Action Days and diesel retrofit programs. NMIM version 20071009, with county database NCD20070912, and NONROAD model version NONROAD2008a (see http://www.epa.gov/otaq/nonrdmdl.htm#model) was used to create NMIM inventories for 2012 and 2015.

California nonroad emissions

Similar to onroad mobile, NMIM was not used to generate future-year nonroad emissions for California, other than for NH_3. We used NMIM for California future nonroad NH_3 emissions because CARB did not provide these data for any nonroad vehicle types. As we did for onroad emissions, we chose a projection approach that would maintain consistency between the base year and future-year emissions for nonroad emissions in California.

California year 2014 nonroad CAP emissions are similar to those used in the 2002v3 projected inventory. However, similar to onroad mobile, California nonroad HAPs were computed as ratios to select CAPs using 2005 NMIM CAP-HAP ratios.

California year 2012 nonroad CAP emissions were computed by linearly interpolating year 2009 and 2014 inventories. And 2012 HAP emissions were also computed using the same 2005-based CAP-HAP ratios used to create 2014 HAP emissions.

3.3.3 Locomotives and Class 1 & 2 commercial marine vessels (alm_no_c3)

Future locomotive and Class 1 and Class 2 commercial marine vessel (CMV) emissions were calculated using projection factors that were computed based on national, annual summaries of locomotive emissions in 2002 and future years. These national summaries were used to create national by-pollutant, by-SCC projection factors; these factors include final locomotive-marine controls and are provided in Table 3-8. Similar to the year-specific projections as the stationary sectors (ptnonipm and nonpt), year 2015 factors were used for year 2014 projections.

Table 3-8. Factors applied to year 2005 emissions to project locomotives and Class 1 and Class 2 Commercial Marine Vessel Emissions

SCC	SCC Description	Pollutant	Year 2012 Factor	Year 2014 Factor
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	CO	0.972	0.950

SCC	SCC Description	Pollutant	Year 2012 Factor	Year 2014 Factor
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	NH_3	1.094	1.124
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	NO_X	0.851	0.765
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	PM_{10}	0.875	0.707
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	$PM_{2.5}$	0.890	0.720
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	SO_2	0.531	0.111
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	VOC	0.951	0.863
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	CO	1.232	1.292
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	NH_3	1.223	1.283
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	NO_X	0.732	0.689
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	PM_{10}	0.768	0.663
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	$PM_{2.5}$	0.778	0.672
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	SO_2	0.166	0.005
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	VOC	0.839	0.707
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	CO	0.303	0.318
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	NH_3	1.223	1.283
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	NO_X	0.339	0.350
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	PM_{10}	0.283	0.286
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	$PM_{2.5}$	0.286	0.288
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	SO_2	0.038	0.001
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	VOC	0.291	0.305
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	CO	1.030	1.054
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	NH_3	1.223	1.283
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	NO_X	0.667	0.572
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	PM_{10}	0.660	0.541
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	$PM_{2.5}$	0.662	0.543
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	SO_2	0.156	0.005
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	VOC	0.738	0.586
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	CO	1.015	1.040
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	NH_3	1.223	1.283
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	NO_X	0.658	0.564
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	PM_{10}	0.650	0.533
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	$PM_{2.5}$	0.651	0.533
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	SO_2	0.155	0.005
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	VOC	0.728	0.578
2285002010	Railroad Equipment;Diesel;Yard Locomotives	CO	1.239	1.299
2285002010	Railroad Equipment;Diesel;Yard Locomotives	NH_3	1.223	1.283
2285002010	Railroad Equipment;Diesel;Yard Locomotives	NO_X	1.133	1.136
2285002010	Railroad Equipment;Diesel;Yard Locomotives	PM_{10}	0.942	0.926
2285002010	Railroad Equipment;Diesel;Yard Locomotives	$PM_{2.5}$	0.962	0.946
2285002010	Railroad Equipment;Diesel;Yard Locomotives	SO_2	0.183	0.006
2285002010	Railroad Equipment;Diesel;Yard Locomotives	VOC	1.548	1.539

The future-year locomotive emissions account for increased fuel consumption based on Energy Information Administration (EIA) fuel consumption projections for freight rail, and emissions reductions resulting from emissions standards from the Final Locomotive-Marine rule (EPA, 2007c). This rule lowered diesel sulfur content and tightened emission standards for existing and new locomotives and marine diesel emissions to lower future year PM, SO_2, and NO_X, and is documented at: http://www.epa.gov/otaq/regs/nonroad/420f08004.htm. Voluntary retrofits under the National Clean Diesel Campaign (http://www.epa.gov/otaq/diesel/index.htm) are not included in our projections.

We applied HAP factors for VOC HAPs by using the VOC projection factors to obtain 1,3-butadiene, acetaldehyde, acrolein, benzene, and formaldehyde. The remaining HAP-metals and other non-VOC HAPs not already provided are held at base-year levels (the 2002 emissions estimates used in the 2005 base case).

Class 1 and 2 CMV gasoline emissions (SCC = 2280004000) are not changed for future year processing. C1/C2 diesel emissions (SCC = 2280002100 and 2280002200) are projected based on the Final Locomotive Marine rule national-level factors provided in Table 3-8. Similar to locomotives, VOC HAPs are projected based on the VOC factor and other HAPs and metals are held at levels in the 2005 (2002 inventory) base case.

3.3.4 Class 3 commercial marine vessels (seca_c3)

The seca_c3 sector emissions data were provided by OTAQ in an ASCII raster format used since the SO_2 Emissions Control Area-International Marine Organization (ECA-IMO) project began in 2005. The (S)ECA C3 year 2002 base case was grown to year 2005 for the 2005 base case and to years 2012 and 2014 for the respective future base cases. Both future base cases do not include ECA or IMO controls and are projected from year 2002 using robust growth rate estimates created by EPA in 2006. These growth rates vary depending on geographic region and pollutant; where VOC HAPs and all criteria air pollutants (CAPs) except for NO_X are assigned region-specific growth rates and NOx receives different rates.

The projection factors used to create the 2012 and 2014 base case seca_c3 sector emissions are provided in Table 3-9. The geographic regions are described in the ECA proposal technical support document: http://www.epa.gov/oms/regs/nonroad/marine/ci/420r09007-chap2.pdf. These regions extend up to 200 nautical miles offshore, though less at international boundaries. North and South Pacific regions are divided by the Oregon-Washington border, and East Coast and Gulf Coast regions are divided east-west by roughly the upper Florida Keys just southwest of Miami.

OTAQ also provided factors to compute HAP emission (based on emissions ratios) on 2/28/2008; these are discussed in the 2005v4 documentation. As with the 2005 base case, this sector uses CAP-HAP VOC integration.

Table 3-9. Factors applied to year 2005 emissions to grow Class 3 Commercial Marine Vessel emissions

Region	Year 2012 factor: NO_X	Year 2012 factor: other CAPs & VOC HAPs	Year 2014 factor: NO_X	Year 2014 factor: other CAPs & VOC HAPs
Outside U.S.	1.374	1.483	1.472	1.599
East Coast	1.441	1.559	1.557	1.696
Gulf Coast	1.233	1.333	1.294	1.409
Great Lakes	1.174	1.184	1.211	1.224
North Pacific	1.282	1.386	1.355	1.476
South Pacific	1.513	1.637	1.649	1.796

3.3.5 Future Year VOC Speciation (on_noadj, nonroad)

We used speciation profiles for VOC in the nonroad and on_noadj sectors that account for the increase in ethanol content of fuels in future years. The same future year profiles were used for 2012 and 2014. In addition, there was no difference between the profiles used for onroad and nonroad exhaust and evaporative VOC. The nonroad refueling profiles were the same as used for stationary gasoline related sources described in Section 3.2.8. For evaporative emissions, combinations of E0 and E10 evaporative profiles were used. For exhaust, combinations of Tier 1 E0 and E10, and Tier 2 E0 and E10 exhaust profiles were used. The combinations for exhaust assumed 50% of the vehicle fleet was Tier 2. The E0 and E10 ratios were based on the AEO projections of E0 and E10 fuels in 2022. After the run, it was recognized that nonroad profiles should not include Tier 2 vehicle profiles or any E85 (nonroad refueling had a very small contribution from an E85 profile). However, some sensitivity runs done showed no impact on the use of the Tier 2 and E85 profiles for nonroad on the modeling results.

3.4 Canada, Mexico, and Offshore sources (othar, othon, othpt, othar_hg, and othpt_hg)

Emissions for Canada, Mexico, and offshore sources were not projected to future years, and are therefore the same as those used in the 2005 base case. Therefore, the Mexico emissions are based on year 1999, offshore oil is based on year 2005, and Canada is based on year 2006. For both Mexico and Canada, their responsible agencies could not provide future year emissions that were consistent with the base year emissions.

3.5 Description of specific growth and control aspects of stationary projections for comment

While the TR remedy affects EGUs, the future-year emissions of other stationary sources impact the results of the modeling because they impact the 2012 contribution analysis and the proportional contribution of EGUs in 2014. Here, EPA identified specific issues that could have impacts on our future-year modeling efforts. In addition, if reviewers of this work intend to provide comment on some of these issues, there is a specific mechanism using an Excel® file that we describe here.

3.5.1 Impact of unavailable future-year emissions from Canada and Mexico

For the states on the southern and northern US borders, the emissions from Canada and Mexico and any associated transport could be important to the assessment of TR. As described above, since neither of these countries were able to provide future-year emissions estimates that were projected from the available base-year emissions, we needed to simply hold emissions constant from base year values. Therefore, we were unable to characterize any expected emissions reductions or increases from sources within Canada and Mexico, and the resulting potential changes in air quality estimates from these emissions changes are unknown.

We believe that the lack of future-year emissions from Canada and Mexico would not significantly change the outcome of the 2012 contribution analyses. This is because those modeling runs used source apportionment modeling techniques to attribute the emissions from individual states to particular downwind nonattainment receptors, and this apportionment is independent of emissions from surrounding regions.

For the analysis that supports the TR remedy in 2014, since the forecast air quality would be lower or higher with decreased or increased emissions from Canadian and Mexican sources, it is conceivable that our 2014 analyses could change with changed emissions. We do not believe that the details of the remedy would have been affected, since the remedy addresses only the contribution from each state. However, our forecasts of continued future-year nonattainment could be affected as a result of a greater or lesser contribution from neighboring countries, which we would ideally be able to address in the TR final rule. Therefore, additional information about future-year emissions for Canada and Mexico and the impact of these country's base and future-year emissions on US modeled air quality predictions would be helpful in the future.

3.5.2 Possible additional improvements to base and future-year stationary point and nonpoint inventories for projection needs

The future-year projections of stationary point and nonpoint inventories are an area of our work to date that could be improved with additional information. This subsection describes information about emissions projections that we were unable to use in our projections because of lack of details.

As part of this documentation and to facilitate comments, we have created an Excel® spreadsheet that provides a mechanism to submit comments on our projection assumptions. This spreadsheet provides control programs that we know exist, but for which we need more information regarding how to apply them to our inventories. It also summarizes nonEGU point source facilities, units, and associated processes, which reviewers should use to provide comments. The state-specific tabs in the spreadsheet include only facilities that emit 100 tons/year or more of SO_2 or NO_X or $PM_{2.5}$ in one of the modeled years (2005, 2012, or 2014) because changes to the projections at these larger facilities are most likely to have an impact on our analysis. The spreadsheet "TR proposal projection comments.xls**"** is available as part of the TR docket as well as on the CHIEF website at http://www.epa.gov/ttn/chief/emch/index.html#transport_rule_proposal**.** Instructions to use the spreadsheet for providing comments are provided in the tab called "Commenter Instructions".

The following elements of the nonEGU point and stationary area projections could be improved in future work.

- Plant closures occurring between 2005 and 2014

- Expected industry growth or contraction for particular plants, industries, nonpoint SCCs, counties, or states. As described in Section 3.2, we assumed that emissions growth held flat during the time period between 2005 and the future years. If reviewers have data or documentation that shows this assumption is poor for a particular industry, and these reductions or increases in emissions are not captured by plant closures, we are interested in receiving comment on this approach.

- Emission controls that are not represented (or are improperly represented) in 2012 or 2014. EPA did not include any expected reductions described by SIPs that are not due to federal measures. Table 3-10 lists measures that we learned about for potential application to the ptnonipm sector, but that did not have specific information that we could use to determine affected plants and units. Table 3-11 lists additional measures that we do not know whether they affect point sources, nonpoint sources, or both. Finally, Table 3-12 lists measures that we assume are relevant for nonpoint sources, but for which we did not have enough information to apply them in our projections. We seek comment using our Excel® spreadsheet that clarifies how these programs can be used to characterize future-year nonEGU emissions.

- Emissions controls at cement facilities that EPA has identified as possible controls, but were not applied in our 2012 or 2014 inventories. We had the following information and are interested in comment on how to apply this information to our TR final inventory. We are also interested in cement controls on other facilities.
    - In Georgia, CEMEX burns tires to reduce NO_X emissions up to 60% in some cases, which is now required by their permit
    - In VA, conversations with state representatives suggest that at least one cement facility in that state has reduced their emissions or plans to do so. Comments on these units in relation to the reductions from our 2005 NEI v2 would be welcomed.

- The NOx SIP call budget demonstration from Missouri, dated 4/26/2005, calls for a 30% reduction in NOx from cement kilns, but we need more specific information about actual reductions on specific units rather than planned reductions.

- Emission controls based on OECA consent decrees (see Section 3.2.6) that are represented improperly. This can easily happen because of assumptions EPA needed to make to lieu of more specific information in the decree documentation. For example, since a company can have latitude in how reductions are distributed across its facilities, EPA may have assumed reductions at facilities that are not expected to receive controls because controls are applied at other facilities to achieve the required company-wide reductions.

Table 3-10. List of known local measures needing details for applying to the ptnonipm sector

State	Description	Effective Date	Pollutants affected	NO_X Reductions	SO_2 Reductions	$PM_{2.5}$ Reductions	Source*
IL	Section 214.421 Combination of fuels at Steel Mills in Metropolitan Areas: regulates the emission of SO_2 in any one hour period from any fuel combustion emission source at a steel mill located in the Chicago or St. Louis (IL) major metropolitan area	2006	NO_X, SO_2, $PM_{2.5}$				8
IL	Section 214.162 Combination of fuels: Regulates the emission of SO_2 in any one hour period from any fuel combustion emission source	2006	SO_2				7
IL	Section 217.388 Control and Maintenance Requirements: Regulates NO_X emissions from stationary reciprocating internal combustion engines and turbines	2007	NO_X				9
MN	Cargill Inc. Consent Decree: Implement enforceable emissions reductions of SO_2 and NO_X from its corn processing and oilseed processing plants of at least 40,000 tpy.	?	NO_X, SO_2	2,500 tpy	15,000 tpy		5
MO	10 CSR 10-5.570 Restriction of Sulfur Emissions from Stationary Boilers: Controls sulfur emissions from station boilers located in Franklin, Jefferson, St. Charles, St. Louis Counties and the City of St. Louis	2009	SO_2				14
MO	10 CSR 10-6.260 Restriction of Emission of Sulfur Compounds: Restricts sulfur compound emissions from any installation except those under CSR 10-6.070 or combustion equipment that uses only pipeline grade natural gas or liquefied petroleum gas	2009	SO_2				13
MO	Controls NO_X emissions from any large stationary internal combustion engine located in Billinger, Butler, Cape Girardeau, Carter, Clark, Crawford, Dent, Dunklin, Franklin, Gasconade, Iron, Jefferson, Lewis, Lincoln, Madison, Marion, Mississippi, Montgomery	2009	NO_X				14
MO	10 CSR 10-6.400 Restriction of	2009	$PM_{2.5}$				12

State	Description	Effective Date	Pollutants affected	NO_X Reductions	SO_2 Reductions	$PM_{2.5}$ Reductions	Source*
	Emission of PM from Industrial Processes: Regulates industrial operation process or activity that emits particulate matter						
OH	Paulding County Emission Limits: Sets emission limits of SO_2 on any coal-fired steam generating unit	2006	$PM_{2.5}$				11
PA	Consent decree, Sunoco Chemicals	2007	SO_2			1,350 tpy	
PA	Cement Kilns – proposed rulemaking approved by the Environmental Quality Board (EQB) on 2/19/2008	?	NO_X	1,180 tpy			
PA	Glass Furnaces - proposed rulemaking approved by the EQB on 2/19/2008	?	NO_X	1,300 tpy			
PA	Anti Idling– final rulemaking to the EQB on 8/19/2008	?	NO_X	3.2 tpd			
PA	Consent decree, Sunoco Refinery Signed 3/20/06, Heater and Boiler NO_X Reduction Plan July 2008	2008 (?)	NO_X				
TX	Control of Emissions of NO_X from Cement Kilns		?				
WV	Permit issued to Capitol Cement in 2006. It requires the shutdown of existing Kiln 9, which is a BART subject source. Low NO_X burners were installed on Kiln 9 in 2004.	2004	NO_X				

* See Source codes listed below Table 3-12

Table 3-11. List of known local measures needing details, including which sectors to apply

State	Description	Effective Date	Pollutants affected	NO_X Reductions	SO_2 Reductions	$PM_{2.5}$ Reductions	Source*
CT	NO_X Reductions from ICI Boilers: Sets emission limitations for NO_X from reciprocating engines of at least 3MMBtu/hr, fuel-burning equipment of at least 5 MMBtu/hr, and waste combustors with capacity of at least 1 ton of waste per hour	2009	NO_X				2
IN	Regulations of Emissions from Outdoor Furnaces and Outdoor Boilers: Regulates the emissions from outdoor furnaces and outdoor boilers; proposed in 2005	?	$PM_{2.5}$				10
MA	Amendments to 310CMR 7.00 Combined heat and power: Amendments to provide an adjustment to CHP emission limits creating “emission credits, ” which are intended to encourage new facilities to capture and use heat from the electrical generating equipment and avoid the installation of a new boiler.	?	NO_X, SO_2	NO_X neutral	reductions as facilities shift from oil to nat. gas		2
MD	Diesel Particulate Reductions	?					Chapter 5 Control Measures 30708
WI	NR 428.05 Requirements and	2007	NO_X				6

	performance standards for existing sources: Regulates NO_X emissions for emission units located in Kenosha, Milwaukee, Manitowoc, Racine, Ozaukee, Washington or Waukesha County that are constructed or last modified before 2/1/2001						
WI	NR 428.22 Emission limitation requirements: Provides NO_X emission limitations on a 30-day rolling average basis	2007	NO_X				6

* See Source codes listed below Table 3-12

Table 3-12. List of known local measures needing details for applying to the nonpt sector

State	Description	Effective Date	Pollutants affected	NO_X Reductions	SO_2 Reductions	$PM_{2.5}$ Reductions	Source*
DE	Regulation No. 1144 Control of Stationary Generator Emission: Ensures emissions of NO_X, PM and SO_2 (among other pollutants) from stationary generators do not adversely impact public health, safety and welfare.	?	NO_X, SO_2, $PM_{2.5}$				4
IL	Section 214.162 Combination of fuels: Regulates the emission of SO_2 in any one hour period from any fuel combustion emission source.	2006	SO_2				7
MA	Amendments (to 310CMR 7.00) to control of air pollution in Berkshire, Pioneer Valley, Merrimack Valley, Metropolitan Boston, Central Mass., and SE Mass. Air pollution control districts; boilers must use natural gas or LSDF only beginning in 2009; PM and NO_X emission limit.	2009	NOX, SO_2, $PM_{2.5}$				1
NJ	NOx RACT Rule 2009: the proposed multi-pollutant (VOC, NO_X, SO_2, $PM_{2.5}$) rule will impact 13 source categories including sources with alternative or facility specific maximum allowable NO_X emission rates; asphalt used for paving; asphalt pavement production plants; and boilers.	2009 - 2015, PHASE D	NO_X, SO_2, $PM_{2.5}$				3
PA	Consent decree, Temple Signed on 8/16/2007, Temple modified NO_X controls on three boilers at the Health Science Campus. NO_X emission reduction expected is 27.4 tons. SEPs included lighting retrofit, diesel retrofit and purchasing wind power.	2008	NO_X				

* See Source codes below

<u>Reference codes for Tables 3-10, 3-11, and 3-12</u>

1) "310 CMR 7.00: Air Pollution Control", Section 7.26: Outdoor Hydronic Heater, Massachusetts Department of Environmental Protection
2) Section 10, Connecticut Department of Environmental Protection, http://www.ct.gov/dep/cwp/view.asp?a=2684&q=331196&depNav_GID=1619.

3) "State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Fine Particulate Matter (PM2.5) National Ambient Air Quality Standard PM2.5 Attainment Demonstration Proposal, Chapter 4: Control Measures", The State of New Jersey Depart
4) "Delaware Administrative Code Title 7, 1100 Air Quality Management Section, Sub-Section 1144 Control of Stationary Generator Emissions", State of Delaware, January 2006, http://regulations.delaware.gov/AdminCode/title7/1000/1100/1144.shtml.
5) "Regional Haze State Implementation Plan for the State of Alabama", Alabama Department of Environmental Management Air Division, February, 2008.
6) "Chapter NR 428: Control of Nitrogen Compound Emissions", Wisconsin Department of Natural Resources, NR 428.04, Register No. 619, July 2007.
7) "Title 35, Subtitle B, Chapter 1, Subchapter c, Part 214, Subpart D, Section 162: Combination of Fuels", Illinois Pollution Control Board, http://www.ipcb.state.il.us/SLR/IPCBandIEPAEnvironmentalRegulations-Title35.asp.
8) "Title 35, Subtitle B, Chapter 1, Subchapter C, Part 214, Subpart Q, Section 421: Combination of Fuels", Illinois Pollution Control Board, http://www.ipcb.state.il.us/SLR/IPCBandIEPAEnvironmentalRegulations-Title35.asp.
9) "Title 35, Subtitle B, Chapter 1, Subchapter C, Part 217, Subpart Q, Section 388: Control and Maintenance Requirements", Illinois Pollution Control Board, http://www.ipcb.state.il.us/SLR/IPCBandIEPAEnvironmentalRegulations-Title35.asp.
10) "Development of New Rules Concerning Regulations of Emissions from Outdoor Furnaces and Outdoor Boilers", IC 13-14-9 Notice, Register Page Number 29 IR 901, December 2005, Indiana Register Volume 29 Number 3.
11) "Paulding County Emission Limits", OAC 3745-18-69, Ohio Division of Air Pollution Control, January 2006.
12) "DRAFT 10 CSR 10-6.400 Restriction of Emission of Particulate Matter from Industrial Processes", Missouri Department of Natulra Resources, 2009
13) "DRAFT 10 CSR 10-6.260 Restriction of Emission of Sulfur Compounds", Missouri Department of Natulra Resources, 2009
14) "DRAFT 10 CSR 10-5.570 Control of Sulfur Emissions from Stationary Boilers", Missouri Department of Natulra Resources, 2009

4 Source Apportionment Scenarios for 2012

EPA prepared special emissions inputs for the CAM_X model to allow CAM_X to be used for source apportionment modeling. Source apportionment modeling was used to quantify the impact of emissions in specific upwind states on projected downwind nonattainment and maintenance receptors for both $PM_{2.5}$ and 8-hour ozone. To prepare these emissions, EPA prepared special tagging input files called GSTAG files for the SMOKE speciation processor.

The tagging input files and custom SMOKE scripts implemented tagging by state of all source emissions except for biogenic and wildfire emissions for all ozone and $PM_{2.5}$ precursors. Separate tagging runs were done for ozone and $PM_{2.5}$ precursors. Biogenic and wildfire emissions were not tagged by state because they are generally considered not feasible for emissions controls, but these were tagged as “other sources” and their contributions could be tracked in total without association with individual states. Prescribed burning and agricultural burning *were* included in the tagged emissions. The states EPA analyzed using source apportionment for ozone and for $PM_{2.5}$ are: Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Vermont, Virginia, West Virginia, Washington D.C., and Wisconsin. There were also several other states that are only partially contained within the 12 km modeling domain (i.e., Colorado, Montana, New Mexico, and Wyoming). However, EPA did not individually track the emissions or assess the contribution from emissions in these states.

5 EGU Control Case for 2014

The 2014 TR Control Case was intended to represent the implementation of NO_X and SO_2 reductions to attain the existing ozone and $PM_{2.5}$ NAAQS standards in the eastern U.S. For the control case modeling, the emissions for all sectors were unchanged from the base case modeling except for those from EGUs (the ptipm sector). EPA used the IPM model to prepare the 2014 control case EGU emissions. The changes in EGU SO_2 and NO_x emissions as a result of the control case for the lower 48 states are summarized in Section 6. Section 6 also provides state-specific summaries of EGU NO_X and SO_2 for the lower 48 states. Additional details on the changes that resulted from the control case are provided in the TR Proposal Regulatory Impact Analysis (RIA), Chapter 7 (Cost, Economic, and Energy Impacts), which describes the modeling conducted to estimate the cost, economic, and energy impacts to the power sector.

States covered by the annual SO_2 and NO_X reductions for annual and/or 24-hour $PM_{2.5}$ standard in the control case are colored in blue and green in Figure 5-1. The 15 “group 1” states in blue are in a stringent SO_2 tier and the 12 (+ D.C.) green “group 2” states are in a moderate SO_2 tier. Each group of states is of uniform stringency which would lead to two exclusive SO_2 trading groups; that is, states in SO_2 group 1 could not trade with states in SO_2 group 2. The smaller SO2 budgets would begin in 2012 for both groups and become smaller for the group 1 states in 2014. All 27 states (+ D.C.) would be in one NO_X tier with uniform stringency beginning in 2012. Section 6 provides annual SO_2 and NO_X summaries for these selected groups/tiers of states.

States covered by the summer-only NO_X reductions for attainment of the 8-hour ozone standard in the control case are highlighted in Figure 5-2. These 25 “group 1” states NO_X reductions would begin after the 2012 ozone season. Section 6 also provides summer-only NO_X summaries for this selected group of states.

Figure 5-1. States Covered under Annual SO_2 and NO_X Reductions for $PM_{2.5}$.

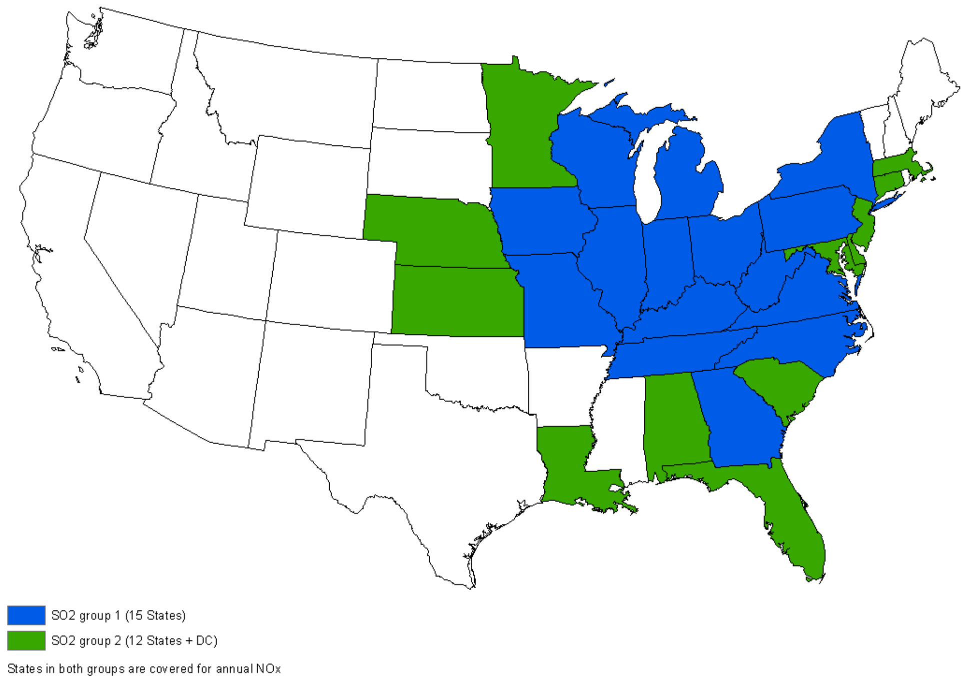
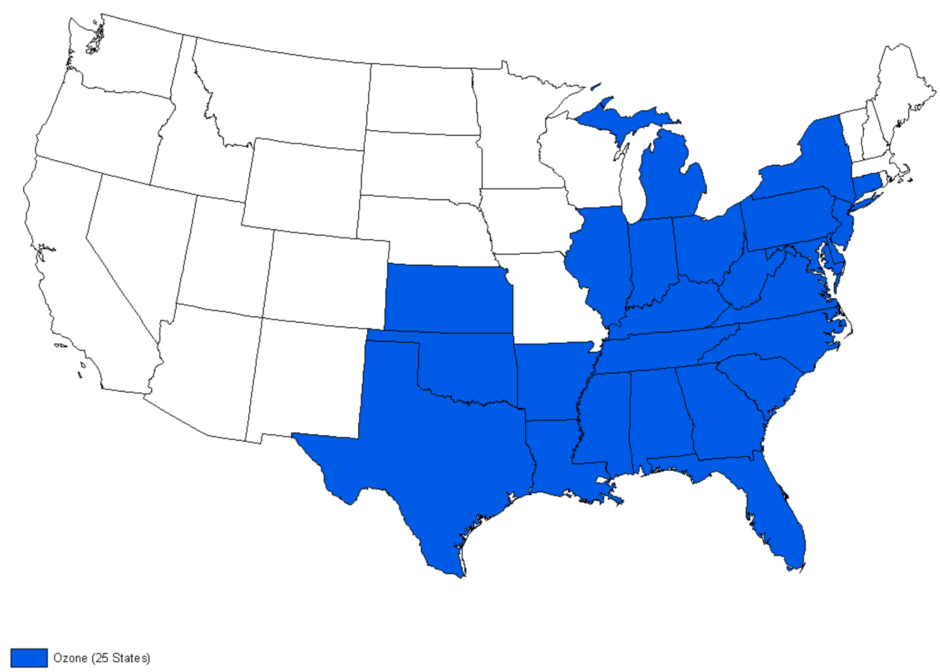


Figure 5-2. States Covered under Summer NO_X Reductions for Ozone



6 Emission Summaries for the Base Cases and Control Case

The following tables summarize emissions differences between the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU control case at various levels of geographic, temporal, and emission sector resolution.

Table 6-1 and Table 6-2 provide NO_X and SO_2 emissions, respectively (except for biogenic emissions, wildfires, and prescribed burning) by state for the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU control cases, as well as differences and percent differences between these cases. The TR proposal preamble contains similar summaries but unlike the summaries here, the preamble summaries differ in the following: 1) they include emissions from wildfires and prescribed burning, and 2) are restricted to only the eastern states –all states are provided in the tables here. See Table 7-2 in Section 7 for state-level summaries containing wildfire and prescribed burning emissions. Note that these "fires" emissions are the same for all emissions cases. Table 6-3 and Table 6-4 provide EGU sector only (ptipm) NO_X and SO_2 emissions (respectively) by state for the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU control cases, as well as differences and percent differences between these cases.

Table 6-5 and Table 6-6 provide NO_X and SO_2 emissions, respectively (except for biogenic emissions, wildfires and prescribed burning) for the 15 state "group 1",12 state + D.C. "group 2", as well as 27 state + D.C. sum of emissions that TR covers for $PM_{2.5}$. See Figure 5-1 for a map of the group 1 and group 2 states. Note that these emissions summaries are different in the TR proposal preamble in the following: 1) we do not include emissions from fires (see Table 7-2 for the contribution from fires), and 2) Oklahoma is in the 25-state "group 2" summaries in these tables. Emissions are provided for the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU control ("remedy") cases, as well as differences and percent differences between these cases. We also provide summaries for all "Eastern Modeling Domain" states and "All Western States". The western states are defined as Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. States in the eastern modeling domain are defined as the rest of the contiguous (lower 48 states) U.S. plus the District of Columbia.

Table 6-7 and Table 6-8 provide EGU sector only (ptipm) NO_X and SO_2 emissions (respectively) for the same 15 state "group 1",12 state + D.C. "group 2", as well as 27 state + D.C. sum of emissions that TR covers for PM2.5. See Figure 5-1 for a map of the group 1 and group 2 states. Emissions are provided for the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU control case, as well as differences and percent differences between these cases. Summaries for the eastern modeling domain states and western states are also provided. Note that unlike the TR proposal preamble, Oklahoma is included in the "eastern modeling domain states" in these tables.

Table 6-9 provides summer (defined as May through September) EGU and Total Anthropogenic NO_X for the 26 states that TR covers for ozone. See Figure 5-2 for a map of these 26 states. Emissions are provided for the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU control ("remedy") cases, as well as differences and percent differences between these cases.

Table 6-1. State-level Total NO_X Emissions (not including fires) for each TR Modeling Case in 48 States and Washington, D.C.

State	2005 Base	2012 Base	2014 Base	2014 Control	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Control minus 2014 Base	
					Difference	% Difference	Difference	% Difference	Difference	% Difference
Alabama	443,748	360,357	337,924	280,763	-83,391	-18.8%	-22,433	-6.2%	-57,161	-16.9%
Arizona	326,613	246,578	218,261	218,219	-80,036	-24.5%	-28,316	-11.5%	-42	0.0%
Arkansas	238,845	197,438	186,969	168,438	-41,407	-17.3%	-10,468	-5.3%	-18,532	-9.9%
California	1,408,585	1,078,451	1,005,519	1,005,553	-330,135	-23.4%	-72,932	-6.8%	35	0.0%
Colorado	298,619	237,869	221,796	222,172	-60,751	-20.3%	-16,073	-6.8%	377	0.2%
Connecticut	116,673	74,786	67,070	67,082	-41,887	-35.9%	-7,717	-10.3%	12	0.0%
Delaware	58,879	39,664	37,330	37,750	-19,215	-32.6%	-2,334	-5.9%	420	1.1%
District of Columbia	15,904	9,802	8,568	8,568	-6,101	-38.4%	-1,234	-12.6%	0	0.0%
Florida	1,038,937	837,914	769,998	699,801	-201,023	-19.3%	-67,916	-8.1%	-70,198	-9.1%
Georgia	577,858	405,825	341,695	337,889	-172,032	-29.8%	-64,130	-15.8%	-3,806	-1.1%
Idaho	97,636	83,046	77,617	77,616	-14,590	-14.9%	-5,429	-6.5%	-1	0.0%
Illinois	773,276	542,886	503,605	480,743	-230,390	-29.8%	-39,281	-7.2%	-22,862	-4.5%
Indiana	614,861	505,039	474,770	386,251	-109,822	-17.9%	-30,269	-6.0%	-88,519	-18.6%
Iowa	312,015	251,632	236,602	221,442	-60,383	-19.4%	-15,030	-6.0%	-15,160	-6.4%
Kansas	365,907	294,634	289,452	250,489	-71,273	-19.5%	-5,183	-1.8%	-38,963	-13.5%
Kentucky	435,837	345,073	324,465	247,270	-90,764	-20.8%	-20,608	-6.0%	-77,195	-23.8%
Louisiana	670,571	583,659	561,795	553,494	-86,912	-13.0%	-21,864	-3.7%	-8,301	-1.5%
Maine	78,680	63,994	59,337	59,333	-14,687	-18.7%	-4,656	-7.3%	-5	0.0%
Maryland	294,519	181,595	171,843	171,923	-112,924	-38.3%	-9,752	-5.4%	80	0.0%
Massachusetts	270,987	191,570	181,754	182,151	-79,417	-29.3%	-9,816	-5.1%	397	0.2%
Michigan	638,546	478,625	444,639	410,319	-159,921	-25.0%	-33,986	-7.1%	-34,320	-7.7%
Minnesota	466,985	350,394	327,977	311,544	-116,591	-25.0%	-22,417	-6.4%	-16,433	-5.0%
Mississippi	288,816	218,968	202,800	188,757	-69,848	-24.2%	-16,168	-7.4%	-14,043	-6.9%
Missouri	505,195	353,407	332,634	317,092	-151,787	-30.0%	-20,774	-5.9%	-15,541	-4.7%
Montana	132,627	104,539	99,054	99,044	-28,088	-21.2%	-5,485	-5.2%	-10	0.0%
Nebraska	244,225	193,852	182,029	164,126	-50,374	-20.6%	-11,823	-6.1%	-17,903	-9.8%
Nevada	137,862	85,527	88,356	88,358	-52,335	-38.0%	2,829	3.3%	2	0.0%
New Hampshire	65,086	43,930	39,746	39,687	-21,156	-32.5%	-4,183	-9.5%	-59	-0.1%
New Jersey	323,327	220,188	203,784	200,233	-103,140	-31.9%	-16,403	-7.4%	-3,552	-1.7%

State	2005 Base	2012 Base	2014 Base	2014 Control	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Control minus 2014 Base	
					Difference	% Difference	Difference	% Difference	Difference	% Difference
New Mexico	305,732	240,892	230,868	230,886	-64,840	-21.2%	-10,024	-4.2%	18	0.0%
New York	609,630	423,170	393,753	393,996	-186,460	-30.6%	-29,417	-7.0%	243	0.1%
North Carolina	536,639	384,430	362,593	360,509	-152,209	-28.4%	-21,837	-5.7%	-2,085	-0.6%
North Dakota	175,182	135,870	130,012	130,003	-39,312	-22.4%	-5,858	-4.3%	-9	0.0%
Ohio	816,239	552,864	518,780	453,167	-263,375	-32.3%	-34,084	-6.2%	-65,612	-12.6%
Oklahoma	426,907	367,457	346,081	315,393	-59,450	-13.9%	-21,376	-5.8%	-30,688	-8.9%
Oregon	212,698	186,809	174,782	174,782	-25,890	-12.2%	-12,026	-6.4%	0	0.0%
Pennsylvania	704,936	566,301	535,515	454,248	-138,635	-19.7%	-30,786	-5.4%	-81,267	-15.2%
Rhode Island	26,926	20,936	19,581	19,577	-5,990	-22.2%	-1,355	-6.5%	-4	0.0%
South Carolina	300,083	236,546	222,148	209,141	-63,538	-21.2%	-14,398	-6.1%	-13,007	-5.9%
South Dakota	81,625	65,334	60,551	60,546	-16,290	-20.0%	-4,783	-7.3%	-5	0.0%
Tennessee	471,705	338,154	310,870	270,171	-133,550	-28.3%	-27,284	-8.1%	-40,699	-13.1%
Texas	1,736,276	1,338,429	1,253,464	1,235,289	-397,847	-22.9%	-84,965	-6.3%	-18,175	-1.4%
Utah	199,580	160,744	151,272	151,254	-38,836	-19.5%	-9,473	-5.9%	-18	0.0%
Vermont	21,801	17,611	15,534	15,534	-4,189	-19.2%	-2,078	-11.8%	0	0.0%
Virginia	461,689	340,933	313,546	311,867	-120,756	-26.2%	-27,387	-8.0%	-1,680	-0.5%
Washington	326,857	272,354	250,161	250,146	-54,503	-16.7%	-22,193	-8.1%	-15	0.0%
West Virginia	294,016	206,630	196,923	144,970	-87,385	-29.7%	-9,707	-4.7%	-51,954	-26.4%
Wisconsin	358,787	257,290	241,488	228,637	-101,496	-28.3%	-15,803	-6.1%	-12,851	-5.3%
Wyoming	222,878	185,963	181,502	181,492	-36,915	-16.6%	-4,461	-2.4%	-10	0.0%
Grand Total	**19,531,805**	**14,879,959**	**13,906,813**	**13,087,712**	**-4,651,846**	**-23.8%**	**-973,146**	**-6.5%**	**-819,101**	**-5.9%**

Table 6-2. State-level Total SO_2 Emissions(not including fires) for each TR Modeling Case in 48 States and Washington, D.C.

State	2005 Base	2012 Base	2014 Base	2014 Control	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Control minus 2014 Base	
					Difference	% Difference	Difference	% Difference	Difference	% Difference
Alabama	592,389	461,314	446,070	296,138	-131,075	-22.1%	-15,244	-3.3%	-149,932	-33.6%
Arizona	88,334	50,335	48,282	50,815	-37,998	-43.0%	-2,053	-4.1%	2,532	5.2%
Arkansas	114,021	126,532	128,986	160,744	12,511	11.0%	2,454	1.9%	31,758	24.6%
California	217,595	223,748	217,669	217,669	6,152	2.8%	-6,079	-2.7%	0	0.0%
Colorado	79,956	81,377	81,086	97,290	1,421	1.8%	-291	-0.4%	16,204	20.0%
Connecticut	34,316	27,389	27,419	24,493	-6,928	-20.2%	30	0.1%	-2,926	-10.7%
Delaware	85,167	38,963	39,629	40,742	-46,203	-54.3%	665	1.7%	1,113	2.8%
District of Columbia	3,914	2,296	2,291	2,291	-1,618	-41.3%	-5	-0.2%	0	0.0%
Florida	649,114	460,481	431,641	376,723	-188,633	-29.1%	-28,840	-6.3%	-54,918	-12.7%
Georgia	748,020	674,183	295,607	214,726	-73,837	-9.9%	-378,575	-56.2%	-80,882	-27.4%
Idaho	23,165	20,332	20,264	20,263	-2,832	-12.2%	-68	-0.3%	-1	0.0%
Illinois	516,950	866,376	340,576	304,834	349,427	67.6%	-525,800	-60.7%	-35,742	-10.5%
Indiana	1,047,371	986,601	960,098	396,403	-60,770	-5.8%	-26,503	-2.7%	-563,695	-58.7%
Iowa	221,877	250,930	244,423	182,875	29,053	13.1%	-6,507	-2.6%	-61,547	-25.2%
Kansas	195,902	109,812	114,915	101,037	-86,090	-43.9%	5,103	4.6%	-13,878	-12.1%
Kentucky	572,424	780,885	798,392	182,630	208,462	36.4%	17,506	2.2%	-615,761	-77.1%
Louisiana	353,597	340,839	326,979	327,046	-12,758	-3.6%	-13,860	-4.1%	67	0.0%
Maine	36,934	48,310	44,490	44,508	11,376	30.8%	-3,820	-7.9%	19	0.0%
Maryland	379,842	142,640	136,078	136,198	-237,202	-62.4%	-6,563	-4.6%	120	0.1%
Massachusetts	158,152	91,564	93,797	86,838	-66,588	-42.1%	2,233	2.4%	-6,959	-7.4%
Michigan	490,190	415,042	402,783	300,560	-75,148	-15.3%	-12,259	-3.0%	-102,223	-25.4%
Minnesota	154,550	95,366	102,374	89,746	-59,184	-38.3%	7,008	7.3%	-12,628	-12.3%
Mississippi	118,965	80,116	81,026	95,233	-38,850	-32.7%	910	1.1%	14,207	17.5%
Missouri	421,979	570,575	623,287	315,283	148,595	35.2%	52,712	9.2%	-308,004	-49.4%
Montana	37,950	26,484	27,192	29,421	-11,467	-30.2%	708	2.7%	2,229	8.2%
Nebraska	121,484	157,817	151,967	111,367	36,332	29.9%	-5,849	-3.7%	-40,601	-26.7%
Nevada	71,535	28,375	35,117	35,493	-43,160	-60.3%	6,742	23.8%	376	1.1%
New Hampshire	63,533	18,146	17,439	18,121	-45,388	-71.4%	-707	-3.9%	682	3.9%
New Jersey	101,380	81,266	82,524	59,410	-20,114	-19.8%	1,258	1.5%	-23,114	-28.0%
New Mexico	46,711	24,930	25,036	24,354	-21,781	-46.6%	105	0.4%	-681	-2.7%

State	2005 Base	2012 Base	2014 Base	2014 Control	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Control minus 2014 Base	
					Difference	% Difference	Difference	% Difference	Difference	% Difference
New York	391,103	341,705	337,581	253,274	-49,398	-12.6%	-4,124	-1.2%	-84,307	-25.0%
North Carolina	648,485	264,544	282,484	238,822	-383,940	-59.2%	17,940	6.8%	-43,661	-15.5%
North Dakota	159,713	93,656	96,341	104,341	-66,057	-41.4%	2,686	2.9%	8,000	8.3%
Ohio	1,276,270	1,076,470	969,383	361,138	-199,799	-15.7%	-107,088	-9.9%	-608,245	-62.7%
Oklahoma	165,819	201,322	210,800	211,021	35,503	21.4%	9,478	4.7%	221	0.1%
Oregon	47,228	48,244	47,971	54,791	1,016	2.2%	-273	-0.6%	6,821	14.2%
Pennsylvania	1,173,296	1,119,680	1,122,844	303,071	-53,616	-4.6%	3,164	0.3%	-819,773	-73.0%
Rhode Island	8,986	9,068	9,321	9,321	82	0.9%	253	2.8%	0	0.0%
South Carolina	303,747	234,200	242,482	217,515	-69,547	-22.9%	8,282	3.5%	-24,968	-10.3%
South Dakota	28,183	25,649	25,614	41,053	-2,534	-9.0%	-35	-0.1%	15,438	60.3%
Tennessee	388,191	708,905	711,369	218,065	320,714	82.6%	2,464	0.3%	-493,304	-69.3%
Texas	934,009	639,505	677,484	771,299	-294,505	-31.5%	37,979	5.9%	93,815	13.8%
Utah	51,593	36,160	36,479	40,182	-15,433	-29.9%	319	0.9%	3,703	10.2%
Vermont	6,987	6,383	6,390	6,390	-603	-8.6%	7	0.1%	0	0.0%
Virginia	344,860	263,564	254,359	176,114	-81,296	-23.6%	-9,205	-3.5%	-78,245	-30.8%
Washington	65,834	75,906	76,087	75,795	10,072	15.3%	181	0.2%	-292	-0.4%
West Virginia	535,586	645,431	553,002	184,341	109,845	20.5%	-92,429	-14.3%	-368,662	-66.7%
Wisconsin	263,615	181,760	191,391	159,927	-81,855	-31.1%	9,631	5.3%	-31,464	-16.4%
Wyoming	122,253	84,508	82,655	87,405	-37,745	-30.9%	-1,853	-2.2%	4,750	5.7%
Grand Total	**14,663,076**	**13,339,684**	**12,281,475**	**7,857,117**	**-1,323,392**	**-9.0%**	**-1,058,208**	**-7.9%**	**-4,424,358**	**-36.0%**

Table 6-3. State-level Electric Generating Unit Sector NO_X Emissions for each TR Modeling Case in 48 States and Washington, D.C.

State	2005 Base	2012 Base	2014 Base	2014 Control	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Control minus 2014 Base	
					Difference	% Difference	Difference	% Difference	Difference	% Difference
Alabama	133,051	121,809	118,420	61,259	-11,241	-8.4%	-3,389	-2.8%	-57,161	-48.3%
Arizona	79,776	80,323	72,747	72,705	546	0.7%	-7,576	-9.4%	-42	-0.1%
Arkansas	35,407	43,222	44,792	26,260	7,815	22.1%	1,570	3.6%	-18,532	-41.4%
California	6,992	20,196	18,394	18,429	13,204	188.9%	-1,802	-8.9%	35	0.2%
Colorado	73,909	61,534	61,641	62,018	-12,375	-16.7%	107	0.2%	377	0.6%
Connecticut	6,865	2,770	2,821	2,833	-4,094	-59.6%	51	1.8%	12	0.4%
Delaware	11,917	4,639	4,513	4,933	-7,278	-61.1%	-126	-2.7%	420	9.3%
District of Columbia	492	2	1	1	-491	-99.7%	0	-14.3%	0	3.7%
Florida	217,263	195,673	180,801	110,603	-21,590	-9.9%	-14,873	-7.6%	-70,198	-38.8%
Georgia	111,017	78,011	48,091	44,285	-33,006	-29.7%	-29,921	-38.4%	-3,806	-7.9%
Idaho	19	397	398	397	377	1961.3%	1	0.3%	-1	-0.3%
Illinois	127,923	77,920	80,228	57,366	-50,003	-39.1%	2,308	3.0%	-22,862	-28.5%
Indiana	213,503	203,107	200,899	112,379	-10,397	-4.9%	-2,208	-1.1%	-88,519	-44.1%
Iowa	72,806	66,316	68,146	52,986	-6,490	-8.9%	1,830	2.8%	-15,160	-22.2%
Kansas	90,220	70,823	78,920	39,958	-19,397	-21.5%	8,097	11.4%	-38,963	-49.4%
Kentucky	164,743	149,179	148,509	71,314	-15,564	-9.4%	-670	-0.4%	-77,195	-52.0%
Louisiana	63,791	44,773	45,457	37,156	-19,018	-29.8%	684	1.5%	-8,301	-18.3%
Maine	1,100	3,139	2,535	2,530	2,039	185.3%	-604	-19.2%	-5	-0.2%
Maryland	62,574	17,376	19,990	20,070	-45,199	-72.2%	2,614	15.0%	80	0.4%
Massachusetts	25,618	6,312	6,619	7,016	-19,305	-75.4%	306	4.9%	397	6.0%
Michigan	120,005	96,874	97,455	63,135	-23,131	-19.3%	580	0.6%	-34,320	-35.2%
Minnesota	83,836	51,285	51,859	35,426	-32,551	-38.8%	574	1.1%	-16,433	-31.7%
Mississippi	45,166	37,517	37,142	23,099	-7,649	-16.9%	-375	-1.0%	-14,043	-37.8%
Missouri	127,431	77,571	82,979	67,437	-49,860	-39.1%	5,408	7.0%	-15,541	-18.7%
Montana	39,858	36,761	36,800	36,789	-3,097	-7.8%	39	0.1%	-10	0.0%
Nebraska	52,426	52,820	52,970	35,067	394	0.8%	149	0.3%	-17,903	-33.8%
Nevada	47,297	20,059	29,198	29,200	-27,237	-57.6%	9,138	45.6%	2	0.0%
New Hampshire	8,827	2,514	2,515	2,456	-6,312	-71.5%	1	0.0%	-59	-2.3%
New Jersey	30,114	15,987	16,268	12,717	-14,128	-46.9%	282	1.8%	-3,552	-21.8%
New Mexico	75,483	51,324	51,340	51,358	-24,159	-32.0%	16	0.0%	18	0.0%

State	2005 Base	2012 Base	2014 Base	2014 Control	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Control minus 2014 Base	
					Difference	**% Difference**	**Difference**	**% Difference**	**Difference**	**% Difference**
New York	63,465	25,755	28,350	28,593	-37,709	-59.4%	2,595	10.1%	243	0.9%
North Carolina	111,576	61,643	61,747	59,663	-49,932	-44.8%	104	0.2%	-2,085	-3.4%
North Dakota	76,381	59,547	59,556	59,548	-16,834	-22.0%	9	0.0%	-9	0.0%
Ohio	258,687	159,627	164,945	99,333	-99,060	-38.3%	5,318	3.3%	-65,612	-39.8%
Oklahoma	86,204	86,858	81,122	50,434	654	0.8%	-5,735	-6.6%	-30,688	-37.8%
Oregon	9,383	13,780	13,889	13,889	4,396	46.9%	110	0.8%	0	0.0%
Pennsylvania	176,870	193,032	196,151	114,884	16,163	9.1%	3,119	1.6%	-81,267	-41.4%
Rhode Island	545	221	281	278	-324	-59.4%	60	27.1%	-4	-1.4%
South Carolina	53,823	47,762	47,512	34,505	-6,061	-11.3%	-251	-0.5%	-13,007	-27.4%
South Dakota	15,650	15,493	15,514	15,509	-157	-1.0%	21	0.1%	-5	0.0%
Tennessee	102,934	68,425	68,779	28,079	-34,509	-33.5%	354	0.5%	-40,699	-59.2%
Texas	176,170	159,738	166,177	148,002	-16,432	-9.3%	6,439	4.0%	-18,175	-10.9%
Utah	65,261	64,073	64,088	64,070	-1,188	-1.8%	14	0.0%	-18	0.0%
Vermont	297	0	0	0	-297	-100.0%	0	0.0%	0	0.0%
Virginia	62,512	36,036	32,115	30,436	-26,475	-42.4%	-3,921	-10.9%	-1,680	-5.2%
Washington	17,634	18,214	18,374	18,359	579	3.3%	160	0.9%	-15	-0.1%
West Virginia	159,804	102,725	100,103	48,149	-57,079	-35.7%	-2,622	-2.6%	-51,954	-51.9%
Wisconsin	72,170	49,351	53,774	40,923	-22,819	-31.6%	4,423	9.0%	-12,851	-23.9%
Wyoming	89,315	73,911	73,919	73,908	-15,404	-17.2%	7	0.0%	-10	0.0%
Grand Total	**3,728,112**	**2,926,427**	**2,908,844**	**2,089,743**	**-801,685**	**-21.5%**	**-17,583**	**-0.6%**	**-819,101**	**-28.2%**

Table 6-4. State-level Electric Generating Unit Sector SO_2 Emissions for each TR Modeling Case in 48 States and Washington, D.C.

State	2005 Base	2012 Base	2014 Base	2014 Control	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Control minus 2014 Base	
					Difference	% Difference	Difference	% Difference	Difference	% Difference
Alabama	460,123	335,734	322,130	172,198	-124,389	-27.0%	-13,604	-4.1%	-149,932	-46.5%
Arizona	52,733	22,773	20,945	23,477	-29,960	-56.8%	-1,828	-8.0%	2,532	12.1%
Arkansas	66,384	85,068	88,187	119,945	18,683	28.1%	3,119	3.7%	31,758	36.0%
California	622	5,052	5,052	5,052	4,430	712.1%	0	0.0%	0	0.0%
Colorado	64,174	72,269	72,119	88,324	8,095	12.6%	-149	-0.2%	16,204	22.5%
Connecticut	10,356	5,493	5,512	2,586	-4,863	-47.0%	19	0.3%	-2,926	-53.1%
Delaware	32,378	7,841	7,806	8,919	-24,538	-75.8%	-35	-0.4%	1,113	14.3%
District of Columbia	1,082	0	0	0	-1,082	-100.0%	0	0.0%	0	0.0%
Florida	417,321	228,360	192,903	137,985	-188,960	-45.3%	-35,458	-15.5%	-54,918	-28.5%
Georgia	616,054	552,007	173,210	92,329	-64,048	-10.4%	-378,796	-68.6%	-80,882	-46.7%
Idaho	0	0	1	0	0	-100.0%	1	N/A	-1	-100.0%
Illinois	330,382	724,657	200,475	164,733	394,274	119.3%	-524,182	-72.3%	-35,742	-17.8%
Indiana	878,978	829,988	804,294	240,599	-48,990	-5.6%	-25,694	-3.1%	-563,695	-70.1%
Iowa	130,264	169,039	163,966	102,419	38,775	29.8%	-5,073	-3.0%	-61,547	-37.5%
Kansas	136,520	59,567	65,125	51,248	-76,953	-56.4%	5,558	9.3%	-13,878	-21.3%
Kentucky	502,731	718,980	739,592	123,831	216,249	43.0%	20,612	2.9%	-615,761	-83.3%
Louisiana	109,851	100,239	94,824	94,892	-9,612	-8.8%	-5,415	-5.4%	67	0.1%
Maine	3,887	15,759	11,650	11,669	11,872	305.4%	-4,109	-26.1%	19	0.2%
Maryland	283,205	49,078	42,635	42,756	-234,127	-82.7%	-6,443	-13.1%	120	0.3%
Massachusetts	85,768	16,299	16,299	9,340	-69,468	-81.0%	0	0.0%	-6,959	-42.7%
Michigan	349,877	287,807	275,637	173,414	-62,070	-17.7%	-12,170	-4.2%	-102,223	-37.1%
Minnesota	101,666	53,596	61,447	48,819	-48,071	-47.3%	7,852	14.6%	-12,628	-20.6%
Mississippi	74,117	46,432	48,149	62,356	-27,685	-37.4%	1,717	3.7%	14,207	29.5%
Missouri	284,384	445,643	500,649	192,644	161,259	56.7%	55,006	12.3%	-308,004	-61.5%
Montana	19,715	15,893	16,863	19,093	-3,822	-19.4%	971	6.1%	2,229	13.2%
Nebraska	74,955	120,790	115,695	75,094	45,836	61.2%	-5,095	-4.2%	-40,601	-35.1%
Nevada	53,363	13,323	20,155	20,531	-40,040	-75.0%	6,832	51.3%	376	1.9%
New Hampshire	51,445	7,290	6,608	7,290	-44,155	-85.8%	-682	-9.4%	682	10.3%
New Jersey	57,044	37,746	37,669	14,555	-19,298	-33.8%	-78	-0.2%	-23,114	-61.4%
New Mexico	30,628	13,211	13,708	13,027	-17,417	-56.9%	497	3.8%	-681	-5.0%

State	2005 Base	2012 Base	2014 Base	2014 Control	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Control minus 2014 Base	
					Difference	% Difference	Difference	% Difference	Difference	% Difference
New York	180,847	144,074	141,354	57,047	-36,773	-20.3%	-2,720	-1.9%	-84,307	-59.6%
North Carolina	512,231	126,620	140,585	96,924	-385,611	-75.3%	13,965	11.0%	-43,661	-31.1%
North Dakota	137,371	77,383	80,320	88,320	-59,988	-43.7%	2,937	3.8%	8,000	10.0%
Ohio	1,116,084	946,667	841,194	232,948	-169,418	-15.2%	-105,473	-11.1%	-608,245	-72.3%
Oklahoma	110,081	156,032	165,773	165,994	45,950	41.7%	9,741	6.2%	221	0.1%
Oregon	12,304	14,381	13,366	20,187	2,077	16.9%	-1,015	-7.1%	6,821	51.0%
Pennsylvania	1,002,202	966,136	972,977	153,204	-36,066	-3.6%	6,841	0.7%	-819,773	-84.3%
Rhode Island	176	0	0	0	-176	-100.0%	0	0.0%	0	0.0%
South Carolina	218,782	149,515	156,096	131,128	-69,267	-31.7%	6,581	4.4%	-24,968	-16.0%
South Dakota	12,215	13,453	13,459	28,897	1,237	10.1%	6	0.0%	15,438	114.7%
Tennessee	266,148	596,987	600,066	106,762	330,839	124.3%	3,079	0.5%	-493,304	-82.2%
Texas	534,949	327,873	373,950	467,765	-207,076	-38.7%	46,077	14.1%	93,815	25.1%
Utah	34,813	24,972	25,414	29,117	-9,842	-28.3%	442	1.8%	3,703	14.6%
Vermont	9	0	0	0	-9	-100.0%	0	0.0%	0	0.0%
Virginia	220,248	145,452	135,741	57,496	-74,796	-34.0%	-9,711	-6.7%	-78,245	-57.6%
Washington	3,409	19,663	19,155	18,863	16,255	476.9%	-508	-2.6%	-292	-1.5%
West Virginia	469,456	588,392	496,307	127,646	118,936	25.3%	-92,085	-15.7%	-368,662	-74.3%
Wisconsin	180,200	107,365	117,253	85,788	-72,836	-40.4%	9,888	9.2%	-31,464	-26.8%
Wyoming	89,874	55,025	53,505	58,254	-34,849	-38.8%	-1,520	-2.8%	4,750	8.9%
Grand Total	**10,381,408**	**9,499,923**	**8,469,819**	**4,045,461**	**-881,485**	**-8.5%**	**-1,030,103**	**-10.8%**	**-4,424,358**	**-52.2%**

Table 6-5. Group 1 and Group 2 States NO_X Total Emissions (not including fires) for each TR Modeling Case

	2005 Base Year	**2012 Base Case**	**2014 Base Case**	**2014 Remedy**	**2014 Remedy - 2012 Base Case**	**Percent Change: 2014 Remedy vs 2012 Base Case**	**2014 Remedy - 2014 Base Case**	**Percent Change: 2014 Remedy vs 2014 Base Case**
Annual Total NO_X Emissions for 15 States in Group 1	8,111,227	5,952,260	5,531,877	5,018,570	-933,690	-15.7%	-513,308	-9.3%
Annual Total NO_X Emissions for 12 States + DC in Group 2	4,610,746	3,574,961	3,361,673	3,137,064	-437,897	-12.2%	-224,608	-6.7%
Annual Total NO_X for 27 States + DC	12,721,973	9,527,221	8,893,550	8,155,634	-1,371,587	-14.4%	-737,916	-8.3%
Annual Total NO_X Emissions for All States Fully within the Eastern Modeling Domain	15,862,117	11,997,188	11,207,626	10,388,190	-1,608,998	-13.4%	-819,435	-7.3%
Annual Total NO_X Emissions for All Western States	3,669,688	2,882,771	2,699,187	2,699,522	-183,249	-6.4%	334	0.0%

Table 6-6. Group 1 and Group 2 States SO_2 Total Emissions (not including fires) for each TR Modeling Case

	2005 Base Year	2012 Base Case	2014 Base Case	2014 Remedy	2014 Remedy - 2012 Base Case	Percent Change: 2014 Remedy vs 2012 Base Case	2014 Remedy - 2014 Base Case	Percent Change: 2014 Remedy vs 2014 Base Case
Annual Total SO_2 Emissions for 15 States in Group 1	9,040,217	9,146,651	8,087,579	3,792,063	-5,354,589	-58.5%	-4,295,516	-53.1%
Annual Total SO_2 Emissions for 12 States + DC in Group 2	3,133,554	2,243,946	2,198,166	1,869,543	-374,403	-16.7%	-328,623	-14.9%
Annual Total SO_2 for 27 States + DC Covered for $PM_{2.5}$	12,173,771	11,390,598	10,285,746	5,661,606	-5,728,992	-50.3%	-4,624,139	-45.0%
Annual Total SO_2 Emissions for All States Fully within the Eastern Modeling Domain	13,810,921	12,639,283	11,583,637	7,123,638	-5,515,645	-43.6%	-4,459,999	-38.5%
Annual Total SO_2 Emissions for All Western States	852,154	700,400	697,838	733,479	33,079	4.7%	35,641	5.1%

Table 6-7. Group 1 and Group 2 States NO_X EGU Sector Emissions for each TR Modeling Case

	2005 Base Year	**2012 Base Case**	**2014 Base Case**	**2014 Remedy**	**2014 Remedy - 2012 Base Case**	**Percent Change: 2014 Remedy vs 2012 Base Case**	**2014 Remedy - 2014 Base Case**	**Percent Change: 2014 Remedy vs 2014 Base Case**
Annual EGU NO_X Emissions for 15 States in Group 1	1,945,446	1,445,575	1,432,270	918,963	-526,613	-36.4%	-513,308	-35.8%
Annual EGU NO_X Emissions for 12 States + DC in Group 2	831,991	632,031	626,150	401,542	-230,489	-36.5%	-224,608	-35.9%
Annual EGU NO_X for 27 States + DC Covered for $PM_{2.5}$	2,777,437	2,077,606	2,058,421	1,320,505	-757,101	-36.4%	-737,916	-35.8%
Annual EGU NO_X Emissions for All States Fully within the Eastern Modeling Domain	3,223,184	2,485,856	2,468,057	1,648,621	-837,234	-33.7%	-819,435	-33.2%
Annual EGU NO_X Emissions for All Western States	504,928	440,572	440,787	441,121	550	0.1%	334	0.1%

Table 6-8. Group 1 and Group 2 States SO_2 EGU Sector Emissions for each TR Modeling Case

	2005 Base Year	**2012 Base Case**	**2014 Base Case**	**2014 Remedy**	**2014 Remedy - 2012 Base Case**	**Percent Change: 2014 Remedy vs 2012 Base Case**	**2014 Remedy - 2014 Base Case**	**Percent Change: 2014 Remedy vs 2014 Base Case**
Annual EGU SO_2 Emissions for 15 States in Group 1	7,040,088	7,349,814	6,303,300	2,007,783	-5,342,031	-72.7%	-4,295,516	-68.1%
Annual EGU SO_2 Emissions for 12 States + DC in Group 2	1,989,050	1,164,259	1,118,141	789,518	-374,740	-32.2%	-328,623	-29.4%
Annual EGU SO_2 for 27 States + DC Covered for $PM_{2.5}$	9,029,138	8,514,073	7,421,441	2,797,302	-5,716,771	-67.1%	-4,624,139	-62.3%
Annual EGU SO_2 Emissions for All States Fully within the Eastern Modeling Domain	10,019,774	9,243,362	8,209,536	3,749,537	-5,493,825	-59.4%	-4,459,999	-54.3%
Annual EGU SO_2 Emissions for All Western States	361,634	256,561	260,283	295,924	39,364	15.3%	35,641	13.7%

Table 6-9. 26-State Total and Electric Generating Unit Sector Summer NO_X Emissions for each TR Modeling Case

	2005 Base Year	**2012 Base Case**	**2014 Base Case**	**2014 Remedy**	**2014 Remedy - 2012 Base Case**	**Percent Change: 2014 Remedy vs 2012 Base Case**	**2014 Remedy - 2014 Base Case**	**Percent Change: 2014 Remedy vs 2014 Base Case**
Summer EGU NO_x Emissions for 26 States Included for Ozone	905,345	718,142	698,827	585,584	-132,559	-18.5%	-113,243	-16.2%
Summer Total NO_x Emissions for 26 States Included for Ozone	5,363,278	4,085,516	3,784,430	3,671,187	-414,329	-10.1%	-113,243	-3.0%

7 Summary of Projected Emissions Changes over Time and Likely Affect on Maintenance

The purpose of this section is to illustrate the overall change in emissions from our TR base case years 2005 and 2014 to those in year 2020. The 2020 base case was developed using a similar projections methodology as described in Section 3 for the 2012 and 2014 base cases. The primary difference in 2020 base case emissions is the continued overall decrease in SO_2 emissions in 2020 compared to 2014. This is primarily due to EGU reductions between 2014 and 2020. However, several states without EGU reductions show small SO_2 increases resulting from increasing Class 3 Commercial Marine Vessel emissions (the C3 CMV control case will significantly reduce these emissions in 2020 but was not signed prior to TR modeling) and other minor source categories. NO_X emissions decrease between 2014 and 2020 in all states because of continued EGU reductions and mobile source reductions. Showing emissions totals for 2014 and 2020 gives a sense as to whether control strategies for TR in 2014 will be enough to maintain air quality improvements in subsequent future years (such as 2020).

Table 7-1 summarizes emissions as they are projected to change over time in the eastern modeling domain states. Note that unlike the TR preamble, Oklahoma is in the eastern modeling domain here. This information is important because it shows that for the most part, total emissions of NO_X and SO_2, considering both EGU and nonEGU sectors, are significantly decreasing over time. Therefore, the reductions and corresponding benefits achieved from the EGU sector as a result of the proposed rule should be maintained over time. Table 7-2 provides details for projected changes to each of the sectors.

As noted in the preamble to the proposed transport rule, EPA considers the maintenance concept to have two components: (1) year-to-year variability in emissions and air quality, and (2) continued maintenance of the air quality standard over time. Regarding component (2), for example, if emissions increases were expected during the time period after the rule took effect, these increases might call into question whether there were sufficient emissions reductions required by the rule to provide for continued maintenance of the NAAQS. EPA uses the information in Table 7-1 to address this issue and to conclude that component (2) does not suggest the need for any further emission reductions requirements.

Table 7-2 shows that:

- Region-wide emissions of both SO_2 and NO_X are substantially decreased between 2014 and 2020.
- Emissions of NO_X are reduced between 2014 and 2020 by a significant degree across the US, largely due to decreases in the mobile source sector, and are reduced in every state.
- Emissions of SO_2 are reduced substantially over the region, about 1/3, and also in most states, with small increases seen in a few generally low-emitting states.

We acknowledge that there are some SO_2 increases projected in some states, such as Arkansas and New York. Therefore, we cannot claim that there will be no maintenance problems anywhere in the country. We propose to review this issue when we do the final rule modeling. At that time, additional information, such as inclusion of new federal rules that have recently been or will be promulgated in the intervening time (e.g., ECA-IMO, Boiler MACT, Portland Cement NESHAP, RICE and Compression Engines and Spark Engines, and Light Duty Greenhouse Gas Rule), will be available that will give us a more realistic estimate of the probable level of emissions in 2020.

In our current future base case platform, there are no additional rules between years 2014 and 2020 that would impact the future year baseline inventories, with the exception that full implementation for some mobile rules (Light Duty Greenhouse Gas Rule) does not occur until 2020 -well after year 2014. The turnover rate for units (EGUs) and vehicles and equipment (onroad mobile and nonroad mobile) results in a lower proportion of mobile emissions to overall anthropogenic emissions in year 2020 than year 2014.

Table 7-1. Eastern Modeling Domain State Total Emissions for 2005, 2014, and 2020 Base Cases

State	2005 NO_X	2014 NO_X	2020NO_X	% Change NO_X 2020-2014	2005 SO_2	2014 SO_2	2020 SO_2	% Change SO_2 2020-2014
Alabama	447,562	341,738	257,883	-24.5%	593,372	447,053	299,125	-33.1%
Arkansas	241,499	189,623	151,411	-20.2%	114,749	129,714	144,144	11.1%
Connecticut	116,688	67,084	58,314	-13.1%	34,320	27,423	27,839	1.5%
Delaware	58,902	37,353	36,216	-3.0%	85,173	39,635	44,010	11.0%
District of Columbia	15,904	8,568	7,117	-16.9%	3,914	2,291	2,292	0.0%
Florida	1,064,537	795,599	672,868	-15.4%	656,131	438,658	410,056	-6.5%
Georgia	585,812	349,650	311,804	-10.8%	750,031	297,618	231,541	-22.2%
Illinois	773,347	503,676	415,949	-17.4%	516,969	340,596	272,106	-20.1%
Indiana	614,949	474,858	326,615	-31.2%	1,047,396	960,123	438,592	-54.3%
Iowa	312,105	236,692	187,129	-20.9%	221,902	244,448	187,608	-23.3%
Kansas	366,285	289,829	263,644	-9.0%	196,005	115,018	115,556	0.5%
Kentucky	437,163	325,791	218,884	-32.8%	572,787	798,755	260,604	-67.4%
Louisiana	673,824	565,049	529,047	-6.4%	354,489	327,871	340,460	3.8%
Maine	79,246	59,903	55,524	-7.3%	37,084	44,640	49,524	10.9%
Maryland	294,656	171,980	166,535	-3.2%	379,874	136,109	135,835	-0.2%
Massachusetts	271,327	182,095	182,258	0.1%	158,245	93,890	103,111	9.8%
Michigan	638,876	444,969	358,917	-19.3%	490,280	402,874	330,022	-18.1%
Minnesota	469,286	330,278	274,942	-16.8%	155,181	103,005	93,643	-9.1%
Mississippi	292,649	206,633	162,685	-21.3%	120,016	82,077	77,858	-5.1%
Missouri	505,873	333,312	276,041	-17.2%	422,165	623,473	316,552	-49.2%
Nebraska	244,607	182,410	157,071	-13.9%	121,589	152,072	160,319	5.4%
New Hampshire	65,223	39,884	34,249	-14.1%	63,571	17,476	18,796	7.6%
New Jersey	323,550	204,007	194,489	-4.7%	101,441	82,585	70,764	-14.3%
New York	610,042	394,165	363,885	-7.7%	391,216	337,694	355,542	5.3%
North Carolina	548,064	374,018	359,664	-3.8%	649,181	283,180	288,137	1.8%
Ohio	816,321	518,861	395,051	-23.9%	1,276,292	969,405	463,374	-52.2%
Oklahoma	428,617	347,791	326,642	-6.1%	166,288	211,268	207,215	-1.9%
Pennsylvania	705,053	535,631	410,031	-23.4%	1,173,328	1,122,876	476,402	-57.6%
Rhode Island	26,930	19,585	18,987	-3.1%	8,987	9,323	10,270	10.2%
South Carolina	302,441	224,505	199,164	-11.3%	304,393	243,129	225,431	-7.3%

Tennessee	472,717	311,882	227,363	-27.1%	388,468	711,647	232,020	-67.4%
Texas	1,741,166	1,258,354	1,132,869	-10.0%	935,187	678,662	665,567	-1.9%
Vermont	21,980	15,713	12,808	-18.5%	7,036	6,439	6,444	0.1%
Virginia	463,145	315,002	297,581	-5.5%	345,259	254,758	220,484	-13.5%
West Virginia	294,801	197,708	139,731	-29.3%	535,802	553,218	181,812	-67.1%
Wisconsin	359,042	241,743	200,083	-17.2%	263,685	191,461	163,196	-14.8%
TOTAL	**15,684,185**	**11,095,937**	**9,383,453**	**-15.4%**	**13,641,806**	**11,480,463**	**7,626,249**	**-33.6%**

Table 7-2. Eastern Modeling Domain State-Sector Emissions for 2005, 2014, and 2020 Base Cases

			NO_X				SO_2			
State	**Region**	**Sector**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**
Alabama	Southeast	NonEGU	74,830	74,622	74,654	32	70,346	69,150	69,154	4
		Nonpoint	32,024	31,939	31,906	-33	52,325	52,313	52,308	-5
		Nonroad	61,623	45,932	37,278	-8,654	6,397	1,873	2,200	327
		Onroad	142,221	67,011	48,606	-18,405	3,199	605	602	-3
		Fires	3,814	3,814	3,814	0	983	983	983	0
		EGU	133,051	118,420	61,625	-56,795	460,123	322,130	173,878	-148,252
Arkansas	Southeast	NonEGU	37,478	37,491	37,512	21	13,066	13,055	13,058	3
		Nonpoint	21,453	21,422	21,410	-12	27,260	27,256	27,254	-2
		Nonroad	63,493	44,299	34,187	-10,112	5,678	142	75	-67
		Onroad	81,014	38,965	30,917	-8,048	1,632	347	349	2
		Fires	2,654	2,654	2,654	0	728	728	728	0
		EGU	35,407	44,792	24,731	-20,061	66,384	88,187	102,681	14,494
Connecticut	Northeast	NonEGU	5,824	5,854	5,896	42	1,831	1,834	1,838	4
		Nonpoint	12,554	12,451	12,411	-40	18,455	18,440	18,434	-6
		Nonroad	21,785	14,410	11,686	-2,724	2,548	1,294	1,654	360
		Onroad	69,645	31,534	25,654	-5,880	1,128	340	334	-6
		Fires	14	14	14	0	4	4	4	0
		EGU	6,865	2,821	2,654	-167	10,356	5,512	5,576	64

			NO_X				SO_2			
State	**Region**	**Sector**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**
Delaware	Northeast	NonEGU	5,567	5,567	5,568	1	34,859	10,974	10,974	0
		Nonpoint	3,259	3,245	3,239	-6	5,859	5,857	5,857	0
		Nonroad	15,567	15,270	15,657	387	11,648	14,891	19,286	4,395
		Onroad	22,569	8,736	7,623	-1,113	422	101	101	0
		Fires	23	23	23	0	6	6	6	0
		EGU	11,917	4,513	4,107	-406	32,378	7,806	7,786	-20
District of Columbia	Southeast	NonEGU	501	501	501	0	686	686	686	0
		Nonpoint	1,740	1,738	1,738	0	1,559	1,559	1,559	0
		Nonroad	3,494	2,398	1,637	-761	414	4	4	0
		Onroad	9,677	3,929	3,240	-689	172	42	42	0
		Fires	0	0	0	0	0	0	0	0
		EGU	492	1	0	-1	1,082	0	0	0
Florida	Southeast	NonEGU	53,778	55,343	55,901	558	57,475	57,521	57,572	51
		Nonpoint	29,533	29,457	29,428	-29	70,490	70,480	70,476	-4
		Nonroad	277,888	278,920	286,675	7,755	93,543	108,579	136,790	28,211
		Onroad	460,474	225,478	170,403	-55,075	10,285	2,159	2,239	80
		Fires	25,600	25,600	25,600	0	7,018	7,018	7,018	0
		EGU	217,263	180,801	104,861	-75,940	417,321	192,903	135,962	-56,941
Georgia	Southeast	NonEGU	53,297	53,557	54,038	481	56,116	56,014	56,058	44
		Nonpoint	38,919	38,797	38,750	-47	56,829	56,813	56,807	-6
		Nonroad	95,175	71,011	58,421	-12,590	13,331	8,263	10,881	2,618
		Onroad	279,449	130,240	107,567	-22,673	5,690	1,307	1,357	50
		Fires	7,955	7,955	7,955	0	2,010	2,010	2,010	0
		EGU	111,017	48,091	45,072	-3,019	616,054	173,210	104,427	-68,783
Illinois	Midwest	NonEGU	97,504	93,059	94,160	1,101	156,154	133,109	133,181	72
		Nonpoint	47,645	47,540	47,500	-40	5,395	5,381	5,376	-5
		Nonroad	223,697	151,373	114,002	-37,371	19,302	390	290	-100
		Onroad	276,507	131,403	104,549	-26,854	5,716	1,221	1,238	17

			NO_X				SO_2			
State	**Region**	**Sector**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**
		Fires	71	71	71	0	20	20	20	0
		EGU	127,923	80,228	55,666	-24,562	330,382	200,475	132,000	-68,475
Indiana	Midwest	NonEGU	73,647	73,523	73,590	67	95,200	95,037	95,044	7
		Nonpoint	30,185	30,107	30,077	-30	59,775	59,764	59,760	-4
		Nonroad	110,100	76,024	57,512	-18,512	9,436	193	149	-44
		Onroad	187,426	94,217	67,816	-26,401	3,981	810	824	14
		Fires	88	88	88	0	24	24	24	0
		EGU	213,503	200,899	97,533	-103,366	878,978	804,294	282,791	-521,503
Iowa	Midwest	NonEGU	39,299	38,831	38,852	21	61,241	60,195	60,197	2
		Nonpoint	15,150	15,038	14,995	-43	19,832	19,817	19,811	-6
		Nonroad	92,965	65,751	48,701	-17,050	8,838	85	74	-11
		Onroad	91,795	48,836	34,104	-14,732	1,702	360	364	4
		Fires	90	90	90	0	25	25	25	0
		EGU	72,806	68,146	50,387	-17,759	130,264	163,966	107,136	-56,830
Kansas	Midwest	NonEGU	70,785	70,730	70,739	9	13,142	13,048	13,049	1
		Nonpoint	42,286	42,238	42,219	-19	36,381	36,375	36,372	-3
		Nonroad	86,553	61,613	46,797	-14,816	8,035	54	56	2
		Onroad	76,062	35,950	26,255	-9,695	1,824	313	314	1
		Fires	378	378	378	0	103	103	103	0
		EGU	90,220	78,920	77,257	-1,663	136,520	65,125	65,661	536
Kentucky	Southeast	NonEGU	35,432	34,979	35,157	178	25,811	23,804	23,822	18
		Nonpoint	17,557	17,413	17,358	-55	34,229	34,210	34,203	-7
		Nonroad	90,669	65,805	51,233	-14,572	6,942	258	118	-140
		Onroad	127,435	57,759	43,037	-14,722	2,711	528	530	2
		Fires	1,326	1,326	1,326	0	364	364	364	0
		EGU	164,743	148,509	70,773	-77,736	502,731	739,592	201,569	-538,023
Louisiana	Southeast	NonEGU	165,162	161,766	161,836	70	165,737	151,216	151,223	7
		Nonpoint	27,559	27,515	27,498	-17	2,378	2,372	2,370	-2

			NO_X				SO_2			
State	**Region**	**Sector**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**
		Nonroad	301,170	274,697	261,499	-13,198	73,233	78,097	91,792	13,695
		Onroad	112,889	52,360	38,760	-13,600	2,399	470	474	4
		Fires	3,254	3,254	3,254	0	892	892	892	0
		EGU	63,791	45,457	36,200	-9,257	109,851	94,824	93,708	-1,116
Maine	Northeast	NonEGU	18,309	18,316	18,326	10	18,519	18,520	18,521	1
		Nonpoint	7,423	7,257	7,192	-65	9,969	9,945	9,935	-10
		Nonroad	13,379	13,169	13,591	422	3,725	4,215	5,472	1,257
		Onroad	38,469	18,061	13,552	-4,509	834	160	159	-1
		Fires	566	566	566	0	150	150	150	0
		EGU	1,100	2,535	2,296	-239	3,887	11,650	15,286	3,636
Maryland	Northeast	NonEGU	24,621	24,687	24,794	107	34,988	34,994	35,004	10
		Nonpoint	21,715	21,626	21,592	-34	40,864	40,851	40,846	-5
		Nonroad	55,812	52,501	53,050	549	17,819	16,966	21,676	4,710
		Onroad	129,796	53,040	49,679	-3,361	2,966	631	641	10
		Fires	137	137	137	0	32	32	32	0
		EGU	62,574	19,990	17,284	-2,706	283,205	42,635	37,636	-4,999
Massachusetts	Northeast	NonEGU	18,429	18,527	18,664	137	19,620	19,624	19,637	13
		Nonpoint	34,373	34,207	34,143	-64	25,261	25,237	25,228	-9
		Nonroad	74,419	75,654	82,257	6,603	25,335	32,043	41,214	9,171
		Onroad	118,148	46,748	40,814	-5,934	2,168	594	594	0
		Fires	341	341	341	0	93	93	93	0
		EGU	25,618	6,619	6,039	-580	85,768	16,299	16,346	47
Michigan	Midwest	NonEGU	94,139	94,079	94,294	215	76,510	76,437	76,460	23
		Nonpoint	43,499	43,360	43,306	-54	42,066	42,066	42,066	0
		Nonroad	101,087	73,939	58,797	-15,142	14,533	7,536	8,286	750
		Onroad	279,816	135,806	98,222	-37,584	7,204	1,107	1,104	-3
		Fires	330	330	330	0	91	91	91	0
		EGU	120,005	97,455	63,968	-33,487	349,877	275,637	202,015	-73,622

			NO_X				SO_2			
State	**Region**	**Sector**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**
Minnesota	Midwest	NonEGU	64,438	64,372	64,580	208	25,169	25,112	25,133	21
		Nonpoint	56,700	56,545	56,485	-60	14,747	14,728	14,721	-7
		Nonroad	115,873	84,040	64,212	-19,828	10,410	468	391	-77
		Onroad	146,138	71,161	53,790	-17,371	2,558	618	620	2
		Fires	2,300	2,300	2,300	0	631	631	631	0
		EGU	83,836	51,859	33,575	-18,284	101,666	61,447	52,147	-9,300
Mississippi	Southeast	NonEGU	53,985	52,440	52,454	14	29,892	24,427	24,429	2
		Nonpoint	12,212	12,133	12,103	-30	6,796	6,785	6,781	-4
		Nonroad	79,394	58,559	46,391	-12,168	6,003	1,280	1,387	107
		Onroad	98,060	42,525	29,583	-12,942	2,158	385	386	1
		Fires	3,833	3,833	3,833	0	1,051	1,051	1,051	0
		EGU	45,166	37,142	18,322	-18,820	74,117	48,149	43,823	-4,326
Missouri	Midwest	NonEGU	38,604	38,744	38,988	244	78,307	77,086	77,111	25
		Nonpoint	32,910	32,677	32,588	-89	44,573	44,543	44,531	-12
		Nonroad	123,228	88,233	68,567	-19,666	10,464	214	124	-90
		Onroad	183,022	90,001	69,493	-20,508	4,251	796	802	6
		Fires	678	678	678	0	186	186	186	0
		EGU	127,431	82,979	65,727	-17,252	284,384	500,649	193,799	-306,850
Nebraska	Midwest	NonEGU	12,156	12,173	12,196	23	6,429	6,431	6,434	3
		Nonpoint	13,820	13,779	13,763	-16	29,575	29,570	29,568	-2
		Nonroad	107,180	75,252	58,478	-16,774	9,199	55	57	2
		Onroad	58,643	27,856	19,134	-8,722	1,326	217	218	1
		Fires	381	381	381	0	105	105	105	0
		EGU	52,426	52,970	53,119	149	74,955	115,695	123,937	8,242
New Hampshire	Northeast	NonEGU	3,241	3,255	3,275	20	3,245	3,246	3,248	2
		Nonpoint	11,235	11,129	11,088	-41	7,408	7,393	7,387	-6
		Nonroad	9,246	6,587	5,115	-1,472	805	45	48	3
		Onroad	32,537	16,260	12,101	-4,159	630	148	149	1

			NOx				SO2			
State	**Region**	**Sector**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**
		Fires	137	137	137	0	38	38	38	0
		EGU	8,827	2,515	2,533	18	51,445	6,608	7,926	1,318
New Jersey	Northeast	NonEGU	20,598	19,089	19,249	160	7,640	6,756	6,771	15
		Nonpoint	26,393	26,298	26,261	-37	10,726	10,712	10,707	-5
		Nonroad	88,486	78,875	76,768	-2,107	23,484	26,589	34,436	7,847
		Onroad	157,736	63,254	59,180	-4,074	2,486	799	797	-2
		Fires	223	223	223	0	61	61	61	0
		EGU	30,114	16,268	12,809	-3,459	57,044	37,669	17,993	-19,676
New York	Northeast	NonEGU	55,122	55,359	55,688	329	58,562	58,584	58,615	31
		Nonpoint	87,608	87,826	87,910	84	125,158	125,196	125,211	15
		Nonroad	121,363	92,841	82,308	-10,533	20,908	10,853	15,885	5,032
		Onroad	282,072	129,376	115,246	-14,130	5,628	1,594	1,589	-5
		Fires	412	412	412	0	113	113	113	0
		EGU	63,465	28,350	22,322	-6,028	180,847	141,354	154,128	12,774
North Carolina	Southeast	NonEGU	44,502	44,573	44,766	193	66,150	66,046	66,066	20
		Nonpoint	18,869	18,669	18,591	-78	22,020	21,994	21,984	-10
		Nonroad	135,936	133,455	142,195	8,740	42,743	52,897	68,844	15,947
		Onroad	225,756	104,150	80,908	-23,242	5,341	961	988	27
		Fires	11,424	11,424	11,424	0	696	696	696	0
		EGU	111,576	61,747	61,780	33	512,231	140,585	129,559	-11,026
Ohio	Midwest	NonEGU	71,715	69,157	69,297	140	118,468	105,123	105,138	15
		Nonpoint	41,466	41,352	41,307	-45	19,810	19,810	19,810	0
		Nonroad	173,988	120,900	92,379	-28,521	15,615	2,085	2,116	31
		Onroad	270,383	122,426	93,881	-28,545	6,293	1,171	1,177	6
		Fires	81	81	81	0	22	22	22	0
		EGU	258,687	164,945	98,106	-66,839	1,116,084	841,194	335,111	-506,083
Oklahoma	Southwest	NonEGU	73,465	72,525	72,567	42	40,482	36,924	36,929	5
		Nonpoint	94,574	94,513	94,490	-23	7,542	7,534	7,531	-3

			NOx				SO_2			
State	**Region**	**Sector**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**
		Nonroad	55,424	39,539	30,318	-9,221	5,015	45	45	0
		Onroad	117,240	58,382	43,889	-14,493	2,699	524	536	12
		Fires	1,709	1,709	1,709	0	469	469	469	0
		EGU	86,204	81,122	83,669	2,547	110,081	165,773	161,705	-4,068
Pennsylvania	Northeast	NonEGU	89,208	84,111	84,363	252	85,411	76,256	76,281	25
		Nonpoint	53,435	53,246	53,173	-73	68,349	68,324	68,314	-10
		Nonroad	118,774	83,885	65,340	-18,545	11,972	4,117	4,644	527
		Onroad	266,649	118,122	95,864	-22,258	5,363	1,169	1,160	-9
		Fires	117	117	117	0	32	32	32	0
		EGU	176,870	196,151	111,174	-84,977	1,002,202	972,977	325,971	-647,006
Rhode Island	Northeast	NonEGU	2,164	2,186	2,217	31	2,743	2,745	2,748	3
		Nonpoint	2,964	2,957	2,955	-2	3,365	3,364	3,364	0
		Nonroad	7,798	7,384	7,762	378	2,494	3,128	4,072	944
		Onroad	13,456	6,772	5,816	-956	208	85	86	1
		Fires	4	4	4	0	1	1	1	0
		EGU	545	281	233	-48	176	0	0	0
South Carolina	Southeast	NonEGU	29,069	28,969	28,998	29	31,495	31,453	31,457	4
		Nonpoint	20,281	20,271	20,267	-4	30,016	30,002	29,996	-6
		Nonroad	68,146	62,400	63,242	842	20,477	24,380	31,791	7,411
		Onroad	128,765	62,996	49,708	-13,288	2,976	551	556	5
		Fires	2,357	2,357	2,357	0	646	646	646	0
		EGU	53,823	47,512	34,592	-12,920	218,782	156,096	130,984	-25,112
Tennessee	Southeast	NonEGU	60,353	59,694	59,864	170	78,206	77,605	77,623	18
		Nonpoint	18,676	18,542	18,490	-52	32,714	32,696	32,690	-6
		Nonroad	82,331	59,145	45,448	-13,697	6,288	173	98	-75
		Onroad	207,410	104,711	74,911	-29,800	4,834	829	852	23
		Fires	1,012	1,012	1,012	0	277	277	277	0
		EGU	102,934	68,779	27,638	-41,141	266,148	600,066	120,481	-479,585

			NO_X				SO_2			
State	**Region**	**Sector**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**
Texas	Southwest	NonEGU	292,806	282,509	283,203	694	223,625	155,720	155,792	72
		Nonpoint	274,338	274,163	274,096	-67	109,215	109,194	109,185	-9
		Nonroad	377,246	289,605	239,110	-50,495	52,749	36,109	42,338	6,229
		Onroad	615,715	241,009	193,768	-47,241	13,470	2,511	2,584	73
		Fires	4,890	4,890	4,890	0	1,178	1,178	1,178	0
		EGU	176,170	166,177	137,803	-28,374	534,949	373,950	354,490	-19,460
Vermont	Northeast	NonEGU	799	803	808	5	902	903	903	0
		Nonpoint	3,438	3,397	3,382	-15	5,385	5,380	5,378	-2
		Nonroad	3,951	2,771	2,112	-659	385	7	7	0
		Onroad	13,316	8,563	6,328	-2,235	305	101	107	6
		Fires	179	179	179	0	49	49	49	0
		EGU	297			0	9			0
Virginia	Southeast	NonEGU	60,101	60,216	60,412	196	69,440	69,177	69,196	19
		Nonpoint	53,605	53,464	53,409	-55	32,923	32,899	32,889	-10
		Nonroad	91,298	75,461	68,679	-6,782	18,420	15,624	20,169	4,545
		Onroad	194,173	92,291	78,824	-13,467	3,829	918	933	15
		Fires	1,456	1,456	1,456	0	399	399	399	0
		EGU	62,512	32,115	34,801	2,686	220,248	135,741	96,897	-38,844
West Virginia	Southeast	NonEGU	36,913	35,700	35,703	3	48,314	41,817	41,817	0
		Nonpoint	14,519	14,459	14,436	-23	14,589	14,581	14,578	-3
		Nonroad	32,739	23,798	18,943	-4,855	2,133	96	64	-32
		Onroad	50,040	22,863	17,787	-5,076	1,095	201	195	-6
		Fires	785	785	785	0	215	215	215	0
		EGU	159,804	100,103	52,077	-48,026	469,456	496,307	124,942	-371,365
Wisconsin	Midwest	NonEGU	40,688	40,729	40,789	60	66,807	66,456	66,463	7
		Nonpoint	21,994	21,974	21,967	-7	6,369	6,370	6,370	0
		Nonroad	75,981	53,848	41,958	-11,890	7,129	638	685	47
		Onroad	147,952	71,163	56,315	-14,848	3,110	675	691	16

			NO_X				SO_2			
State	**Region**	**Sector**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**	**2005 Base Case**	**2014 Base Case**	**2020 Base Case**	**2020 Base - 2014 Base**
		Fires	256	256	256	0	70	70	70	0
		EGU	72,170	53,774	38,799	-14,975	180,200	117,253	88,917	-28,336
Grand Total			**15,684,185**	**11,095,937**	**9,383,453**	**-1,712,484**	**13,641,806**	**11,480,463**	**7,626,249**	**-3,854,214**

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APPENDIX A

Ancillary Data Files Used for TR 2005 Case Compared to 2012 and 2014 Base Case Scenarios

To match the Datasets and Versions listed in this table to actual data files, combine the Dataset name and the version number in the following pattern: <Dataset Name>_<Date>_<Version number>.txt, where <Date> is the last date of change for that version and will have a unique value for the combination of Dataset Name and Version number.

Table A-1. Detailed list of ancillary file data differences between the TR 2005 Base Case and the 2012 and 2014 Base Cases

Input	Environment Variable	Dataset 2005 base case	Version 2005 Base	Sector	Dataset 2012 base case	Version 2012 cases	Dataset 2014 cases	Version 2014 cases	Impact? And comments
Onroad temperature adjustments	ADJ_FACS	MOVESPmOcEcTempAdj Factors 2005	1	on_moves_runpm	MOVESPmOcEcTempAdj Factors 2005		MOVESPmOcEcTempAdj Factors_2014_JAN2010	1	No impact for running mode emisions
Onroad temperature adjustments	ADJ_FACS	MOVESPmOcEcTempAdj Factors 2005	1	on_moves_startpm	MOVESPmOcEcTempAdj Factors 2005		MOVESPmOcEcTempAdj Factors_2014_JAN2010	1	The upwards PM adjustment for cold start emissions is slightly less in 2014 than 2005 (and 2012)
nonpoint & nonroad surrogate xref	AGREF	amgref_us_can_mex_revised	5	All sectors	amgref_us_can_mex_revised	7	same as 2012		No impact. SCCs added for unrelated modeling inventories.
Grid Description List	GRIDDESC	griddesc_lambertonly	24	All sectors	griddesc_lambertonly	13	same as 2012		No impact. Later versions contain additional grids not used in 2012 and 2014 TR modeling.
GSCNV - pollutant to pollutant conversions	GSCNV	gscnv_cmaq_cb05_tx_pf4	2	All sectors	gscnv_cmaq_cb05_tx_pf4	3	same as 2012		No impact. Duplicate records removed in 2012 and 2014 base case.
GSCNV - pollutant to pollutant conversions tier2	GSCNV	N/A		All sectors	gscnv_cmaq_cb05_tier2_ nontoxic	0	same as 2012		Yes. Future year contains Tier 1 and Tier 2 E0 and E10 combination profiles.
GSCNV - pollutant to pollutant conversions tier2 NONHAPVOC	GSCNV	N/A		All sectors	gscnv_cmaq_cb05_tier2_toxic	0	same as 2012		Yes. Future year contains Tier 1 and Tier 2 E0 and E10 combination profiles.
Combination profiles	GSPRO_COMBO	gspro_combo_2005	2	All sectors	replaced with many datasets	--	same as 2012		Yes. 2005 onroad, nonroad, and stationary gasoline distribution-related sources do not contain Tier 2 E0/E10 combination profiles.
Combination profiles for onroad	GSPRO_COMBO	N/A		on_noadj	gspro_combo_2012_onroad_ nonroad_exhevp	1	same as 2012		Yes. Contains Tier 2 E0 and E10 combination profiles for onroad mobile.
Combination profiles for nopt	GSPRO_COMBO	N/A		nonpt	gspro_combo_stationary _aeo.TXT	0	same as 2012		Yes. Future year contains E0/E10/E85 blend based on ethanol penetration for gasoline distribution (bulk terminal to pump) sources.
Combination profiles for nonroad rfl	GSPRO_COMBO	N/A		nonroad	gspro_combo_nonroadrefuel_aeo	0	same as 2012		Yes. Future year contains E0/E10/E85 blend based on ethanol penetration for nonroad refueling sources.
Combination profiles for ptnonipm	GSPRO_COMBO	N/A		ptnonipm	gspro_combo_stationary_aeo.TXT	0	same as 2012		Yes. Future year contains E0/E10/E85 blend based on ethanol penetration for gasoline distribution (bulk terminal to pump) sources.

Input	Environ ment Variable	Dataset 2005 base case	Version 2005 Base	Sector	Dataset 2012 base case	Version 2012 cases	Dataset 2014 cases	Version 2014 cases	Impact? And comments
Combination profiles for nonroad exh-evp	GSPRO_COMBO	N/A		nonroad	gspro_combo_2012_onroad_nonroad_exhevp	1	same as 2012		Yes. Contains Tier 2 E0 and E10 combination profiles for onroad mobile.
Speciation profiles for TOG -noBAF- tier 2 mobile profiles used for future year only	GSPRO	N/A		All sectors	gspro_cmaq_cb05_tier2_nontoxic	1	same as 2012		Yes. Contains Tier 2 profiles for onroad and nonroad mobile VOC (TOG) to toxics not including benzene, acetaldehyde and formaldehyde (BAF).
Speciation profiles for TOGBAF - tier 2 mobile profiles used for future year only	GSPRO	N/A		All sectors	gspro_cmaq_cb05_tier2_BAF	2	same as 2012		Yes. Contains onroad and nonroad Tier 2 E0 and E10 profiles for VOC (TOG) to benzene.
Speciation profiles for NONHAPTOG - tier 2 mobile profiles for future only	GSPRO	N/A		All sectors	gspro_cmaq_cb05_tier2_toxic	0	same as 2012		Yes. Contains Tier 2 profiles for onroad and nonroad mobile non-HAP VOC (TOG) to toxics.
Speciation xref static NOX -- HONO for mobile sources	GSREF	gsref_static_nox_hono_pf4	3	All sectors	gsref_static_nox_hono_pf4	3	gsref_static_nox_hono_pf4	**4**	Yes. SCCs in California 2014 nonroad inventory added that were not found in other cases.
Speciation xref for VOC, not year-specific	GSREF	gsref_voc_general	19	All sectors	gsref_voc_general_rfs2_2022	3	same as 2012		Yes. Gasoline Distribution SCCs removed in future year for alternate future year VOC speciation -see gsref_voc_future_rfs2_nomobile
Speciation xref for VOC, year-specific	GSREF	gsref_voc_2005	2	All sectors	gsref_voc_future_rfs2_mobile	1	same as 2012		Yes. Future year onroad and nonroad mobile assigned to Tier 2 E0/E10 combination profiles for all VOC modes.
Speciation xref for NONHAPVOC, not year-specific	GSREF	gsref_nonhapvoc_general_update	3	All sectors	gsref_nonhapvoc_general_rfs2_2022	4	same as 2012		Yes. Same as gsref_voc_general_rfs2_2022 but for non-HAP VOC emissions for future year emissions.
Speciation xref for NONHAPVOC, year-specific	GSREF	gsref_nonhapvoc_2005	1	All sectors	N/A		same as 2012		Yes. Same as gsref_voc_general for 2005 base case but for non-HAP VOC emissions.
Speciation xref HG	GSREF	gsref_hg	5	All sectors	gsref_hg	7	same as 2012		No. Mercury emissions not included in TR.
Speciation xref for NONHAPVOC, year-specific, mobile records	GSREF	N/A		All sectors	gsref_nonhapvoc_future_rfs2_mobile	0	same as 2012		Yes. Same as gsref_voc_future_rfs2_mobile but for non-HAP VOC emissions for future year emissions.

Input	Environ ment Variable	Dataset 2005 base case	Version 2005 Base	Sector	Dataset 2012 base case	Version 2012 cases	Dataset 2014 cases	Version 2014 cases	Impact? And comments
Speciation xref for NONHAPVOC, year-specific, stationary records	GSREF	N/A		All sectors	gsref_nonhapvoc_future_rfs2_nomobile	0	same as 2012		Yes. Same as gsref_voc_future_rfs2_nomobile but for non-HAP VOC emissions for future year emissions.
Speciation xref for speciated VOC	GSREF	gsref_speciated_voc	1	othpt	gsref_voc_future_rfs2_nomobile	3	same as 2012		Yes. Gasoline Distribution SCCs in future year use E0/E10 combination assignments.
Inventory Table - HAPCAP integration but no toxics	INVTABLE	invtable_hapcapintegate_cb05soa_nomp	4	All sectors	invtable_hapcapintegate_cb05soa_nomp	4	invtable_hapcapintegate_cb05soa_nomp	**7**	No impact. VOC mode species saved for reporting purposes in 2012 and 2014.
onroad surrogate xref default	MGREF	amgref_us_can_mex_revised	7	All sectors	amgref_us_can_allmex3	10	same as 2012		No impact. Updated Canadian surrogates in the 2005 dataset, but these emissions were not rerun for 2012 and 2014.

APPENDIX B

Inventory Data Files Used for Each TR Modeling Case - SMOKE Input Inventory Datasets

In any of the following dataset names where the placeholder <mon> has been provided, this is intended to mean 12 separate files with the <mon> placeholder replaced with either jan, feb, mar, apr, may, jun, jul, aug, sep, oct, nov, or dec, each associated with a particular month of the year.

Several inventories are the same in the 2005 base case and all future year cases. These inventories are listed in the “All Cases” in Table B-1. In addition, only the EGU sector (ptipm) emissions are different between the 2014 base case and 2014 control case.

Table B-1. List of inventory data associated with TR modeling cases.

Case	Sector	SMOKE Input Files
2005 Base (2005ck_05b)	ptipm	Annual: ptinv_ptipm_hap2005v2_allHAPs_revised12mar2009_12mar2009_v0_orl.txt
		Annual: ptinv_ptipm_cap2005v2_revised12mar2009_12mar2009_v0_orl.txt
		Daily: ptday_ptipm_caphap_cem_2005ck_<mon>_ida.txt
		Daily: ptday_ptipm_caphap_noncem_2005ck_<mon>_ida.txt
	ptnonipm	ptinv_ptnonipm_xportfrac_cap2005v2_20nov2008_revised_20jan2009_v0_orl.txt
		ptinv_ptnonipm_hap2005v2_revised_24feb2009_v0_orl.txt
	afdust	arinv_afdust_2002ad_xportfrac_26sep2007_v0_orl.txt
	ag	arinv_ag_cap2002nei_06nov2006_v0_orl.txt
	alm_no_c3	arinv_lm_no_c3_cap2002v3_20feb2009_v0_orl.txt
		arinv_lm_no_c3_hap2002v4_20feb2009_v0_orl.txt
	nonpt	arinv_nonpt_pf4_cap_nopfc_04feb2009_v1_orl.txt
		arinv_pfc_2002_caphap_27dec2007_v0_orl.txt
		arinv_nonpt_pf4_hap_nopfc_20feb2009_v1_orl.txt
		arinv_nonpt_cap_2005_WRAP_OilGas_04feb2009_v0_orl.txt
	nonroad	arinv_nonroad_calif_caphap_2005v2_<mon>_02apr2008_v0_orl.txt
		arinv_nonroad_caps_2005v2_<mon>_revised_08sep2008_v0_orl.txt
		arinv_nonroad_haps_2005v2_<mon>_revised_05sep2008_v0_orl.txt
	on_noadj	mbinv_on_noadj_moves_<mon>_14NOV08_14nov2008_v0_orl.txt
		mbinv_onroad_calif_caphap_2005v2_<mon>_02apr2008_v0_orl.txt
		mbinv_onroad_capshaps_2005v2_nmim_not2moves_<mon>_08sep2008_v0_orl.txt
	on_moves_runpm	mbinv_onroad_moves_runpm_<mon>_20oct2008_v0_orl.txt
	on_moves_startpm	mbinv_onroad_moves_startpm_<mon>_20oct2008_v0_orl.txt
	seca_c3	ptinv_seca_c3_caps2005pf4_31jul2008_v0_orl.txt
		ptinv_seca_c3_haps_NonUS_central2005pf4_09sep2008_v0_orl.txt
		ptinv_seca_c3_haps_NonUS_east2005pf4_09sep2008_v0_orl.txt
		ptinv_seca_c3_haps_NonUS_west2005pf4_09sep2008_v0_orl.txt
		ptinv_seca_c3_haps_central2005pf4_31jul2008_v0_orl.txt
		ptinv_seca_c3_haps_east2005pf4_31jul2008_v0_orl.txt
		ptinv_seca_c3_haps_west2005pf4_31jul2008_v0_orl.txt
All Cases	avefire	arinv_avefire_2002ce_21dec2007_v0_ida.txt
		arinv_avefire_2002_hap_18nov2008_v0_orl.txt
	othar	arinv_canada_afdust_xportfrac_cap_2006_03feb2009_v0_orl.txt
		arinv_canada_ag_cap_2006_03feb2009_v0_orl.txt
		arinv_canada_aircraft_cap_2006_04feb2009_v0_orl.txt
		arinv_canada_marine_cap_2006_03feb2009_v0_orl.txt

Case	Sector	SMOKE Input Files
		arinv_canada_oarea_cap_2006_02mar2009_v3_orl.txt
		arinv_canada_offroad_cap_2006_04feb2009_v0_orl.txt
		arinv_canada_rail_cap_2006_03feb2009_v0_orl.txt
		arinv_nonpt_mexico_border1999_21dec2006_v0_ida.txt
		arinv_nonpt_mexico_interior1999_21dec2006_v0_ida.txt
		arinv_nonroad_mexico_border1999_21dec2006_v0_ida.txt
		arinv_nonroad_mexico_interior1999_21dec2006_v0_ida.txt
	othar_hg	arinv_area_canada_hg_2000_noduplicates_23jul2008_v0_ida.txt
	othon	mbinv_canada_onroad_cap_2006_04feb2009_v0_orl.txt
		mbinv_onroad_mexico_border1999_21dec2006_v0_ida.txt
		mbinv_onroad_mexico_interior1999_21dec2006_v0_ida.txt
	othpt	ptinv_canada_point_2006_orl_09mar2009_v2_orl.txt
		ptinv_canada_point_cb5_2006_orl_10mar2009_v0_orl.txt
		ptinv_canada_point_uog_2006_orl_02mar2009_v0_orl.txt
		ptinv_mexico_border99_03mar2008_v1_ida.txt
		ptinv_mexico_interior99_05feb2007_v0_ida.txt
		ptinv_ptnonipm_offshore_oil_cap2005v2_20nov2008_20nov2008_v0_orl.txt
	othpt_hg	ptinv_point_canada_hg_2000_08sep2008_v1_ida.txt
2012 Base (2012ck_05b)	ptipm	ptinv_ptipm_2012ck_05b_summer_23apr2009_v0_orl.txt
		ptinv_ptipm_2012ck_05b_winter_23apr2009_v0_orl.txt
		ptday_ptipm_caphap_cem_2012ck_<mon>_ida.txt
		ptday_ptipm_caphap_noncem_2012ck_<mon>_ida.txt
	ptnonipm	ptinv_ptnonipm_2012ck_05b_BASE_17Apr2009_orl_17apr2009_v0_orl.txt
	afdust	arinv_afdust_2012ck_05b_BASE_09apr2009_v0_orl.txt
	ag	arinv_ag_2012ck_05b_BASE_09apr2009_v0_orl.txt
	alm_no_c3	arinv_alm_no_c3_2012ck_05b_BASE_13apr2009_v0_orl.txt
	nonpt	arinv_nonpt_2012ck_05b_BASE_09apr2009_v0_orl.txt
	nonroad	arinv_nonroad_calif_caphap_2012_<mon>_07apr2009_v0_orl.txt
		arinv_nonroad_caphap_2012_<mon>_27mar2009_v0_orl.txt
	on_noadj	mbinv_onroad_calif_caphap_2012_<mon>_07apr2009_v0_orl.txt
		mbinv_onroad_caphap_not2moves_2012_<mon>_13apr2009_v0_orl.txt
		mbinv_onroad_moves_noadj_2012_<mon>_13apr2009_v0_orl.txt
	on_moves_runpm	mbinv_onroad_moves_runpm_2012_aug_07apr2009_v0_orl.txt
	on_moves_startpm	mbinv_onroad_moves_startpm_2012_aug_07apr2009_v0_orl.txt
	seca_c3	ptinv_eca_c3_caps2012pf4_16mar2009_v0_orl.txt
		ptinv_eca_c3_haps_NonUS_central2012pf4_16mar2009_v0_orl.txt

Case	Sector	SMOKE Input Files
		ptinv_eca_c3_haps_NonUS_east2012pf4_16mar2009_v0_orl.txt
		ptinv_eca_c3_haps_NonUS_west2012pf4_16mar2009_v0_orl.txt
		ptinv_eca_c3_haps_central2012pf4_16mar2009_v0_orl.txt
		ptinv_eca_c3_haps_east2012pf4_16mar2009_v0_orl.txt
		ptinv_eca_c3_haps_west2012pf4_16mar2009_v0_orl.txt
2014 Base + Control (2014ck_05b + 2014ck2_catr1_05b)	ptnonipm	ptinv_ptnonipm_hap2015ck1_CoST_27nov2009_v0_orl.txt
		ptinv_ptnonipm_xportfrac_cap2015ck1_CoST_27nov2009_v0_orl.txt
	afdust	arinv_afdust_xportfrac_2015ck_27nov2009_v0_orl.txt
	ag	arinv_ag_cap2015ck_27nov2009_v0_orl.txt
	alm_no_c3	arinv_lm_no_c3_cap2015ck_27nov2009_v0_orl.txt
		arinv_lm_no_c3_hap2015ck_27nov2009_v0_orl.txt
	nonpt	arinv_nonpt_cap_2005_WRAP_OilGas_04feb2009_v0_orl.txt
		arinv_nonpt_pf4_cap_nopfc_2015ck1_27nov2009_v0_orl.txt
		arinv_nonpt_pf4_hap_nopfc_2015ck1_fixed_no_wrap_oilgas_07dec2009_v0_orl.txt
		arinv_pfc_caphap2015_02apr2008_v0_orl.txt
	nonroad	arinv_nonroad_calif_cap2014_<mon>_29jun2007_v0_orl.txt
		arinv_nonroad_calif_hap_2014_<mon>_15dec2009_v0_orl.txt
		arinv_nonroad_caphap_2014ck_<mon>_07jan2010_v0_orl.txt
	on_noadj	mbinv_onroad_calif_cap2014_<mon>_10aug2007_v0_orl.txt
		mbinv_onroad_calif_hap_2014_<mon>_13jan2010_v0_orl.txt
		mbinv_on_noadj_caps_hg_baf2014ck_<mon>_07JAN2010_07jan2010_v0_orl.txt
		mbinv_on_noadj_MOVES_2014ck2_<mon>_11feb2010_v0_orl.txt
	on_moves_runpm	mbinv_on_moves_runpm_2014ck2_<mon>_11feb2010_v0_orl.txt
	on_moves_startpm	mbinv_on_moves_startpm_2014ck2_<mon>_11feb2010_v0_orl.txt
	seca_c3	ptinv_eca_c3_BAF_HAPs2014pf31_08jan2010_v0_orl.txt
		ptinv_eca_c3_CAPs2014pf31_08jan2010_v0_orl.txt
2014 Base (2014ck2_05b)	ptipm	ptinv_PTINV_EPA302_EISA_3e_summer_2015_18MAY2009_12jan2010_v0_orl.txt
		ptinv_PTINV_EPA302_EISA_3e_winter_2015_18MAY2009_12jan2010_v0_orl.txt
		ptday_ptipm_caphap_cem_2014ck_<mon>_ida.txt
		ptday_ptipm_caphap_noncem_2014ck_<mon>_ida.txt
2014 Control(2014ck2_catr1_05b)	ptipm	ptinv_PTINV_EPA302_EISA_98_summer_2015_25JAN2010_25jan2010_v0_orl.txt
		ptinv_PTINV_EPA302_EISA_98_winter_2015_25JAN2010_25jan2010_v0_orl.txt
		ptday_ptipm_caphap_cem_2014ck_catr1_<mon>_ida.txt
		ptday_ptipm_caphap_noncem_2014ck_catr1_<mon>_ida.txt

APPENDIX C – OECA Consent Decrees

Table C-1. Description of application of OECA Consent Decrees for future-year projections

Corporation	**Pollutant**	**Compliance Date**	**Description of reductions**	**2005 Emissions (tons/year)**
Bunge	NO_X	31DEC2005	Combined NO_X emissions reduced by 278 tons per year. Combined is over select Bunge facilities.	942
	PM	31DEC2005	Combined PM emissions reduced by 258 tons per year. Combined is over select Bunge facilities.	1,266
	SO_2	31DEC2005	Combined SO_2 emissions reduced by 574 tons per year. Combined is over select Bunge facilities.	2,926
	VOC	31DEC2005	Combined VOC emissions reduced by 1,122 tons per year. Combined is over select Bunge facilities.	2,761
Cargill	CO	01SEP2010	Combined CO emissions reduced by 10,900 tons per year. Combined over select Cargill facilities.	11,167
	NO_X	01SEP2007	Combined NO_X emissions reduced by 1,350 tons per year. Combined over select Cargill facilities.	4,451
	SO_2	01SEP2008	Combined SO_2 emission reduced by 2,250 tons per year. Combined over select Cargill facilities.	10,527
	VOC	01SEP2008	Combined VOC emissions reduced by 98% or 10,450 tons per year. Combined over select Cargill facilities.	6,617
Conoco Phillips	NO_X	31DEC2008	Combined NO_X emissions reduced by 10,000 tons per year. Combined over select Conoco Phillips facilities.	17,409
	SO_2	31DEC2008	Combined SO_2 emissions reduced by 37,100 tons per year. Combined over select Conoco Phillips facilities	31,003
Dupont	SO_2	01MAR2010	Annual SO_2 emissions cap at 123 tons per year at James River	0
		01MAR2012	Annual SO_2 emissions cap at 248 tons per year at Wurtland	2,268
			Annual SO_2 emissions cap at 281 tons per year at Fort Hill	2,228
		01SEP2009	Annual SO_2 emissions cap at 1,007 tons per year at Burnside.	9,517
Hunt	NO_X	31DEC2010	Must meet heat input capacity of 150 mmBTU/hr or greater such that weighted average is no greater than 0.044 lbs/mmBTU, applied at Lumberton, Sandersville, and Tuscaloosa.	350
	SO_2	31DEC2007	No burning of fuel greater than 5 wt% sulfur. SO_2 emissions will not exceed 20ppm or that weighted average H_2S concentrations will not exceed 162 ppm H_2S, applied at Lumberton, Sandersville, and Tuscaloosa.	939
MGP Ingredients	CO	2009	CO reductions by 90%	31
	VOC	2009	VOC reductions by 95%	112

Corporation	Pollutant	Compliance Date	Description of reductions	2005 Emissions (tons/year)
Rhodia Inc	SO_2	01JUL2007	Annual emission limit of 2.2 lbs/ton.	240
			Annual emission limit of 2.5 lbs/ton	396
			Must meet SCAQMDR limit (1.7lbs/ton or less)	392
		01JUL2009	Annual emission limit of 2.2 lbs/ton.	282
		01MAY2012	Baton Rouge #1 -> limit of 1.9 lbs/ton. Baton Rouge #2 -> limit of 2.2 lbs/ton	7,920
		2008	Houston #8 -> limit of 2.5 lbs/ton within 1 year of Date of Entry. Houston #2 -> limit of 1.8 /lbs/ton within 1 year of Date of Entry	9,686
St. Mary's Cement	NO_X	30APR2009	Reduce combined NO_X emissions by 2,700 tons per year.	1,700
Sunoco	NO_X	2006 (Marcus Hook, PA)	Combined NO_X emissions reduced by 4,500 tons per year. Combined over select Sunoco facilities.	746
		31DEC2009 (Toledo, OH)	Combined NO_X emissions reduced by 4,500 tons per year. Combined over select Sunoco facilities.	2,339
		31DEC2010 (Philadelphia, PA)	Combined NO_X emissions reduced by 4,500 tons per year. Combined over select Sunoco facilities.	3,390
	PM	2006 (Marcus Hook, PA)	Combined PM emissions reduced by 300 tons per year. Combined over select Sunoco facilities.	34
		31DEC2009 (Toledo, OH)	Combined PM emissions reduced by 300 tons per year. Combined over select Sunoco facilities.	391
		31DEC2010 (Philadelphia, PA)	Combined PM emissions reduced by 300 tons per year. Combined over select Sunoco facilities.	591
	SO_2	2006 (Marcus Hook, PA)	Combined SO_2 emissions reduced by 19,500 tons per year. Combined over select Sunoco facilities.	3,536
		31DEC2009 (Toledo, OH)	Combined SO_2 emissions reduced by 19,500 tons per year. Combined over select Sunoco facilities.	9,072
		31DEC2010 (Philadelphia, PA)	Combined SO_2 emissions reduced by 19,500 tons per year. Combined over select Sunoco facilities.	3,353
Total Petrochemicals USA	CO	2007	Annual CO emissions cap at 120 tons per year.	386
	NO_X	31DEC2009	Annual NO_X emissions cap at 180 tons per year.	798
	SO_2	2010	Annual SO_2 emissions cap at 800 tons per year.	146

Corporation	Pollutant	Compliance Date	Description of reductions	2005 Emissions (tons/year)
Valero	NO_X	2011	Combined NO_X emissions reduced by 1870 tons per year. Combined is over facilities: Lima, Memphis, and Port Arthur.	4,165
		31DEC2011	Combined NO_X emissions reduced by 4,000 tons per year. Combined over Valero facilities in Ardmore OK, Benicia CA, Martinez CA, Wilmington CA, Denver CO, St. Charles LA, Krotz Spring LA, Paulsboro NJ, Corpus Christi TX (east and west), Houston TX, Sunray TX, Texas City TX, and Three Rivers TX.	13,742
	PM	31DEC2011	Combined PM emissions reduced by 526 tons per year. Combined over Valero facilities listed in other two lists for NOx and SO2.	3,027
	SO_2	2011	Combined SO_2 emissions reduced by 1,810 tons per year. Combined is over facilities: Lima, Memphis, and Port Arthur.	4,105
		31DEC2011	Combined SO_2 emissions reduced by 16,000 tons per year. Combined over Valero facilities in Ardmore OK, Benicia CA, Martinez CA, Wilmington CA, Denver CO, St. Charles LA, Krotz Spring LA, Paulsboro NJ, Corpus Christi TX (east and west), Houston TX, Sunray TX, Texas City TX, and Three Rivers TX.	19,618